COVID-19 related mortality profile at a tertiary care centre: A descriptive study

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Abstract:

Background/Aim: The recent pandemic of Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV-2) is yet another scourge from the coronaviridae family that causes illnesses ranging from common cold to more severe diseases such as Middle East respiratory syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV). The numbers are still on the rise, despite a country wide lockdown and yet no definitive drugs and or/vaccines are available to manage the active COVID-19 cases. **Methods:** The present research design was a hospital based observational descriptive study conducted at S. M. S. Medical College and Attached hospitals, Jaipur, that analysed data of all the patients with COVID-19 related mortality, admitted between 1 April to 4 May 2020. Patients included in this study were RT-PCR confirmed cases of SARS-CoV-2 using nasopharyngeal and oropharyngeal swab samples. **Results:** The mean age of patients with COVID-19 related mortality was 53.41 ± 18.42 year with majority of patients belonging to age group of more than 60 years (41.18 %) followed closely by COVID-19 positive patients in age range of 45 to 60 years (33.33 %). The male to female ratio was 1.68: 1. Mean time lag between hospitalization and death reported was 6.18 days. Majority of the patients admitted (72.5 %) succumbed within 3 days of hospitalization. Eleven patients (21 %) were brought dead to the hospital who were tested COVID-19 positive after death. Most common comorbidity reported in patients with COVID-19 related mortality was hypertension (30 %) followed by diabetes mellitus (27.5 %). **Conclusion:** Hypertension and diabetes mellitus might be independent risk factors making an individual susceptible to COVID-19 related death. Elderly patients also have a greater risk of mortality. The non-availability of definitive management protocol and/or vaccine against COVID-19 makes public health preventive measures of social distancing, use of masks and frequent handwashing an important modality in the fight against COVID-19.

Keywords: age; comorbidity; COVID-19; hypertension; mortality

INTRODUCTION

The recent pandemic of Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV-2) also known as Corona Virus Disease 2019 (COVID-19) is yet another scourge from the Coronaviridae family that causes illnesses ranging from common cold to more severe diseases such as Middle East respiratory syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV).

SARS-CoV-2 is a novel coronavirus that has not been previously identified in humans. The current pandemic of COVID-19 has affected 215 countries, areas, or territories worldwide as of 8 May 2020, and has infected 3,822,382 people worldwide, causing 263,658 confirmed deaths [1]. The spread of COVID-19 began from Wuhan, a city of Hubei province of China and was declared a pandemic by World Health Organization (WHO) on 11 March 2020 [2].

The clinical spectra of COVID-19 is varied ranging from mild to moderate symptoms of cough, sore throat, headache, rhinorrhoea, vomiting and diarrhoea, fever and shortness of breath to signs and symptoms complex of severe pneumonia, acute respiratory distress syndrome, septic shock and/or multiple organ failure [3]. The disease is highly infectious with a reproductive number (R0) ranging from 2.2-3.5, that explains its rapid spread like wild fire throughout the world [4].

India has been struggling to contain the spread of virus and has managed to flatten the curve at 41,472 active cases and 2,109 deaths as of 10th May 2020, since the first reported SARS-CoV-2 case on 30 January 2020 [5]. The numbers are still on the rise, despite a country wide lockdown with yet no definitive management protocol inclusive of drugs and or/vaccines available to manage the active COVID-19 cases. State of Rajasthan is among the top five states of India with 3,708 confirmed cases of COVID-19 and 106 deaths reported till now. The present study was undertaken to appreciate and describe mortality profile of SARS-CoV-2 at one of premier Institute of Tertiary Care Medical College of Rajasthan and South-East Asia.

METHODS

The present study, a hospital based observational descriptive study, was conducted at SMS Medical College and attached hospitals, Jaipur, sharing the highest load of patients in the Rajasthan that analysed and evaluated data of all COVID-19 related mortality of patients admitted between 1 April to 4 May 2020. A total of 51 mortalities were reported due to COVID-19 during this duration at this institute. All the patients were reverse - transcription polymerase chain reaction (RT - PCR) positive for SARS-CoV-2 using nasopharyngeal and oropharyngeal swab samples, tested at the Laboratory of Microbiology of the Institute. The data where collected and analysed preserving the anonymity of patients. Patients were categorised into five different age groups to evaluate the relation between age and COVID-19 related mortality. Patients were also categorized in three groups based upon the number of days stayed in hospitals. The COVID-19 patients were also categorised

based upon the underlying comorbidities to evaluate its relation with COVID-19 related mortalities. Data was presented and compared as mean and percentage of distribution among different groups.

RESULTS

During a period of 34 days from 1st April to 4th May 2020 there were 51 deaths reported due to COVID-19. The mean age of patients with COVID-19 related mortality was 53.41 ± 18.42. The highest mortalities (n = 21, 41.18 %) were reported in the group above 60 years of age, closely followed by 45-60 years age group (n = 17, 33.33 %). The lowest mortality was observed in paediatric age group below 15 years with overall one death (1.96 %). Males (n = 32, 62.74 %) were affected more than the females (n = 19, 37.26 %) with a male to female ratio of 1.68 : 1. One death was reported in pregnant female positive for COVID-19. (Table 1).

Majority of patients (n = 29, 72.5 %) succumbed within a duration of 1-3 days during hospital stay. Six patients (15 %) survived for a duration of 4-6 days and only five patients (12.5 %) could survive for more than six days. The Mean time lag between hospitalization and death reported was 6.18 days. The comorbidity most prevalent in patients with COVID-19 related mortality was hypertension (n = 12, 30 %), closely followed by diabetes mellitus (n = 11, 27.5 %). Other comorbidities such as cardiovascular diseases (n = 6, 15 %), respiratory disease (n = 6, 15 %), sepsis (n = 6, 15 %), gastrointestinal disease (n = 4, 10 %), multiple organ dysfunction syndrome (n = 3, 7.5 %) and chronic kidney disease (n = 2, 5 %). Four patients (10 %) with COVID-19 related mortality did not have any associated comorbidities. There were 11 patients (21.57 %) who were brought dead and were reported positive for SARS-CoV-2 *post mortem* (Table 1 and Figure 1).

DISCUSSION

The disease spectrum of COVID-19 may vary from a mild illness to fatal complications like pneumonia, acute respiratory distress syndrome (ARDS), multi-organ failure, septic shock, disseminated in-

Table 1. *Characteristics of patients with COVID-19 related mortality*

	Number of patients with COVID-19 related mortality	Percent
Age Group (years, n = 51)		
0-15	1	1.96
15-30	8	15.67
30-45	4	7.84
45-60	17	33.33
> 60	21	41.18
Gender (n=51)		
Female	19	37.26
Male	32	62.74
Hospital stay group (days, n=40)		
1 - 3	29	72.5
4 - 6	6	15
> 6	5	12.5
Comorbidity (n=40)		
No comorbidity	4	10
Hypertension	12	30
Diabetes Mellitus	11	27.5
Chronic Kidney Disease	2	5
Cardiovascular Disease	6	15
Respiratory Disease	6	15
Gastrointestinal Disease	4	10
Sepsis	6	15
MODS	3	7.5
Brought in status (n=51)		
Brought Dead	11	21.57
Brought alive	40	78.43

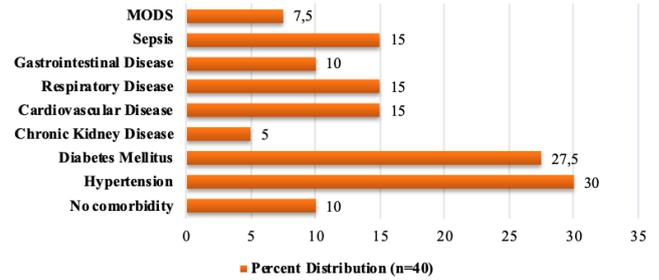MODS = Multiple organ dysfunction syndrome

Figure 1.
Comorbidities in patients with COVID-19 related mortality
MODS = Multiple organ dysfunction syndrome

travascular coagulation and ultimately leading to death [6][7]. Outcome of COVID-19 may be poorer in case of underlying comorbidities [8].Therefore, identification of such underlying factors is of paramount importance in COVID-19 management. In the present study the mean age of patients with COVID-19 related mortality was 53.41 ± 18.42, suggesting a higher mortality among elderly individuals. Chen et al [9] also observed a similar average age profile of COVID-19 positive patients in the median age of 55.5.

Majority of patients afflicted with COVID-19 belonged to the age group of more than 60. Several studies have observed this association, indicating elderly age contributing to a severe outcome [10][11][12][13]. An elderly individual might be susceptible to COVID-19 due to age-related changes in pulmonary functions with obvious responsiveness and tolerance, subsequently leading to poor outcome in this age group [14]. COVID-19 exhibited preponderance for male individuals with a male to female ratio of 1.68 : 1, a finding that has been reported in various studies worldwide [3][15]. Jin et al [16] also observed that the number of men with COVID-19 related mortality was 2.4 times higher than that of women.

In the present study hypertension was the most prevalent comorbidity in COVID-19 related mortality, closely followed by diabetes mellitus. This indicates a higher mortality risk in COVID-19 patients presenting with hypertension, followed by diabetes mellitus, a finding that supplants the observations of Guan et al from China [15] and Itelman et al from Israel [17], supporting the premise that

chances of morbidity and mortality in COVID-19 positive patients increase with associated comorbid conditions. Hypertension has been suggested as a risk factor for poor outcome in COVID-19 patients in several studies [12][13][18]. A similar finding in hypertensives was also observed in the present study. The exact mechanism underlying this observation is still unclear. However, the use of angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers used for treatment of hypertension has been linked to severe outcome in such patients. These drugs have been found to augment ACE2 mRNA expression [19]. SARS-CoV-2 has been found to utilis e this ACE2 receptor for invading the human cells [20]. A higher expression of these receptors facilitates entry of this virus, increasing the susceptibility of individuals to this infection and subsequently a severe disease. This receptor not only acts as the entry receptor of SARS-CoV-2, but also protects the lung from injury due to its anti-inflammatory effects [21].

ACE2 exhibits anti-inflammatory and protective role that has been found downregulated in diabetics [22]. The downregulated anti-inflammatory response could be responsible for exaggerated immune response to SARS-CoV-2 virus in diabetics, with a severe and uncontrolled damage to the lungs and other tissues. This might explain the high mortality in diabetics observed in the present study. Respiratory and other cardiovascular diseases were also observed in patients with COVID-19 related mortality in this study. Acute respiratory distress syndrome with extensive inflammation, cell death, alveolar damage and oedema occurs in severe COVID-19 case leading to a hypoxic state due to reduced gaseous exchange [23][24]. This could explain the possible severe outcome in patients with pre-existing respiratory diseases, as has been observed in this study.

Mortality in COVID-19 patients with cardiovascular diseases observed in this study could be attributable to a wide expression of ACE2 in cardiovascular system that is more pronounced in cardiovascular disease [25][26]. Several researchers have pointed out the myocardial damage and related mortality in patients of SARS-CoV-2 infection

[3][27][28]. In the present study around 3/4 of the patients succumbed within 3 days of hospitalization and surprisingly 1/5 of the patients was brought dead, who were tested positive post mortem. This finding indicates a rapid progression of COVID-19 in these patients.

The disease profile of COVID-19, inclusive of its behaviour, progress and severity scale, is crucial to determine appropriateness and adequacy of mitigation strategies and to enable planning and designing health-care needs and policies. Moreover, factors that might contribute to rapid progression of COVID-19, such as virulence, drug resistance, host factors or structural reformation of the virus, needs to be explored and should form the epicentre of focus especially in people without any risk factors. Country wide lockdown and social distancing has helped in containing the spread of virus to some extent, but the stumbling economy due to lock down poses a great challenge worldwide.

CONCLUSION

Hypertension and diabetes mellitus might be independent risk factors making an individual susceptible to COVID-19 related death. Elderly patients also have a greater risk of mortality. The non-availability of definitive management protocol and/or vaccine against COVID-19 makes public health preventive measures of social distancing, use of masks and frequent handwashing an important modality in the fight against COVID-19.

Conflict of interest

None.

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