

Are numbers deceptive? Is death auditing a solution for death analysis, among the COVID-19 deceased?: A study from a dedicated COVID-19 hospital in Faridabad, Haryana

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ABSTRACT

Background: COVID-19 pandemic has havocted the entire world and India has not been spared. The focus is not only on the containment but on the reduction in mortality also. The objective of the study was to know the trend of COVID-19 deaths in a 510-bedded dedicated COVID-19 hospital and to determine the cause of death and various factors associated with these deaths. **Method:** A descriptive study was conducted in a COVID-dedicated hospital setting to analyze deaths occurring during April–July, 2020 using a standard death audit proforma. **Results:** A total number of 95 COVID-19 patients died in ICU. The mortality rate among ICU patients varied from 24.6% to 52.9%. Most of the cases were referred from other hospitals. About 64% of the deceased was admitted in severe condition and 34% of cases were referred on ventilator support. The week-wise trend revealed a positive association between the number of deaths and the number of referred cases as well as the number of patients received on ventilator support and in severe condition. About one-third of cases were late in seeking treatment at health centers with the same weekly trend. Being unaware of the condition (1%) and the stigma associated with the disease (32%) were the reasons behind it. Common direct causes of death were pneumonia (73%), pneumonia complicated with sepsis (16%), and acute respiratory disease syndrome (ARDS) (7%). **Conclusion:** High case fatality rate in the ICU of a referral COVID-dedicated hospital is mainly because of the admission of patients in severe conditions.

Keywords: Case-fatality ratio, cause of death, co-morbidities, flu clinic, surveillance

Introduction

COVID-19 has become one of the leading causes of death worldwide. As per the World Health Organization (WHO), the case fatality rate (CFR) of COVID is varying from 0.1 to 25%.^[1] Factors behind this huge variation are numerous:

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the socioeconomic condition of the state, availability, and affordability of health resources including logistics and manpower for diagnosis and management, awareness among the state population about the infection prevention and control as well as demographic factors such as age, sex, occupation, comorbidities and condition of the patient at the time of admission to a health care facility, to name a few.^[2,3]

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In India, CFR is 2.0% as on August 10, 2020, while in the State of Haryana, a Northern State of India adjacent to the capital New Delhi, the CFR is comparatively low, that is, 1.4%.^[4] To know the various factors related to COVID-19 deaths, the State started auditing of the death occurring in various health centers across the state in the month of June. A standard audit proforma was developed by the state authority to collect information about the deceased and his death. The death auditing committee was constituted in various health centers and institutes for This same.

The institute was declared dedicated COVID-19 hospital (DCH) and became a referral center in the district in the month of May. The institution has observed an increased number of deaths since then. Therefore, the study was planned to know the actual trend of COVID-19 deaths, the direct cause of death of the cases, and various factors contributing to or associated with these deaths occurring in the institute.

Methodology

1.1. Study Type: Cross-sectional, hospital-based observational type of study.

1.2. Setting: The study was conducted in a medical college hospital, which has been declared as a dedicated COVID Hospital (DCH) by the state government and has become a major referral center for the district with the daily average admission rate as high as 70--100.

1.3. Study subjects: All confirmed COVID-19 deaths occurring in the hospital from April 2020 to July 2020 were included in the study, except those who were brought dead.

1.4. Study Tool: A standard 'COVID-19 Death Audit Performa' introduced by the state to audit all the deaths occurring in the hospitals across the state.^[5] This study represents the findings of the audit committee for the month of April to July 2020. The proforma has two major parts to gather as much information as needed:

Part A deals with health facility-based details such as personal details, symptom onset, sampling details, isolation history of the deceased, mode of identification of COVID status, condition at the time of admission to the present facility, and details of referral before coming to the present facility.

Part B deals with clinical audits designed to collect detailed information from relatives of the deceased regarding awareness about the disease/treatment, delay, and reasons for the delay in treatment if applicable. This part also collects complete information about treatment received in the hospital, including ICU stay and oxygen/ventilation support as well as the direct cause of death and associated comorbidities.

The tool was also aptly designed to study various factors which may contribute to death in COVID-19 cases, such as i) delay in seeking adequate medical consultation, ii) delay in treatment at the institute, and iii) condition of the patient at the time

of admission as it is usually linked with the Management and outcome.

For the audit, a network with nurses, undergraduate medical students, and resident doctors was developed so that one could reach the hospital within half an hour of death. Before the body was handed over to the kith or kin of the deceased, the questionnaire was presented to them and Data was collected by a trained investigator from the team. After counseling as a matter of routine, verbal autopsy was done by interviewing the relatives of the deceased, with complete empathy toward the family.

The above proforma was introduced by the state in the month of June 2020. Therefore, for auditing of the deaths that occurred in the months of April and May 2020, relatives of the deceased were contacted and interviewed telephonically to collect the required information.

1.5. Ethics

COVID-19 has been declared notifiable disease under the Indian Epidemic Act, 1897 (amendment 2020). The state of Haryana has started to audit all the cases, including deaths in COVID-19 cases occurring across the states. The data are published weekly by the Director of Health Services (IDSP), Directorate of Health Services, Government of Haryana. The data in this study are the part of the audit and, permission to publish the data are taken from the appropriate state authority. Anonymity and confidentiality of the data has been maintained.

1.6. Operational definitions:

- **COVID-19 Death Case:** A COVID-19 death is defined for surveillance purposes as a death resulting from a clinically compatible illness in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 disease.^[6]
- **Mild case:** Lab confirmed COVID-19 cases presenting with fever and/or upper respiratory tract illness (Influenza Like Illness, ILI).^[7]
- **Moderate case:** Lab confirmed COVID-19 cases presenting with pneumonia without signs of severe disease (Respiratory Rate 15 to 30/min, SpO₂ 90---94%).^[7]
- **Severe case:** Lab confirmed COVID-19 cases presenting with severe pneumonia (with respiratory rate ≥ 30 /minute and/or SpO₂ < 90% in room air) or ARDS or septic shock.^[7]
- **Active surveillance:** Detection of flu like cases in containment zones during house to house surveys, through mobile medical clinics in non-containment zones or during thermal checking in various offices/workplace settings and submitted for COVID-19 tests.
- **Passive surveillance:** Regular reporting of data by all institutions that were attended by patients for their flu like symptoms.

1.7. Statistical analysis: Data were entered into Microsoft Excel 2016. Commercially available statistical software (IBM SPSS Statistics V25.0) was used for analysis. Descriptive data were expressed as absolute numbers and percentages. The

percentage for any sum with the denominator being less than 100 was shown as the nearest complete numbers and other percentages were shown as the nearest one decimal point.

Results

As per the available hospital census, the total number of COVID-19 patients admitted in the hospital during the study period, were 1824 (32 cases, 290 cases, 852 cases and 623 cases for the month of April to July, respectively). The majority of them were discharged after recovery showing the recovery rate of the institution at 96.9%, 96.6%, 95.9%, and 91.5%, respectively, for the month April to July, with the corresponding mortality rate being 3.1%, 3.1%, 4.0%, and 8.5%, respectively. During the months of May to July 17 cases (5.9%), 130 cases (15.5%) and 106 cases (17.0%) were admitted into the ICU either directly or transferred from the wards. The duration of ICU stay was few hours to 19 days with an average stay of 5 days. A total number of 95 COVID-19 patients died in the hospital (all in the ICU) during the study period. The mortality rate among ICU patients was 52.9%, 24.6%, and 50.0% for the month of May to July, respectively [Table 1].

More than three-fourths of the total number of deaths occurred in the age group of 41--70 years (85 cases, 90%) with the maximum number in the age-group of 61--70 years (35 cases, 37%), whereas the least number of deaths were found in the age group of 0--20 years (2 cases, 2%). Gender-wise the number was more among males (64.2%) than females (35.8%) [Table 2].

Forty-nine deceased (52%) came to know about their COVID status as a result of passive surveillance when they attend flu clinics. Forty-five deceased (47%) discovered their COVID status when they consulted a physician for some non-COVID ailments and the attending physician referred the deceased to ARI clinics to confirm/rule out COVID-19. Active surveillance was responsible for finding the rest one case [Table 2].

Among 95 cases admitted in the ICU, initially, 64% were put on nasal prongs or non-rebreathing mask (NRM), 11% were put on Non-invasive Ventilation (NIV) and 29% were put on ventilator directly, depending upon the assessment of the severity of respiratory embarrassment. All the deceased were ultimately put on the ventilator. The total duration of respiratory support, including NRM, NIV, and ventilator was from a few hours to 62 days with an average duration of 6 days. The duration of ventilator support was from a few hours to 15 days with an average duration of 2 days.

To show the trends of deaths and various factors related to it, the study period was divided into 14 calendar weeks, the first week being the week of first death reported. Week-wise death number had increased from one in the first week to 17 in the 10th week and then decreased to nine in the 14th week. Most of the cases (65 cases, 68%) were referred from other hospitals. The week-wise referral was increased from one case in the first week to 13 in the 10th week and then decreased to six in 14th

Table 1: Hospital and ICU Census (April-July, 2020)

Month	Hospital admissions	ICU admission	Discharge	Death	Recovery rate	Death rate
April	32	0	31	1	96.9%	3.1%
May	290	17	280	9	96.6%	3.1%
June	854	132	819	34	95.9%	4.0%
July	623	106	570	53	91.5%	8.5%

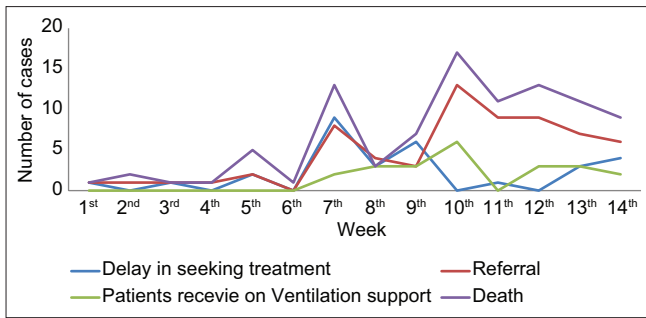
Table 2: Basic characteristics of deceased (n=95)

Variable	n	%
Age		
0-10 Years	1	1.0
11-20 Years	1	1.0
21-30 Years	3	3.2
31-40 Years	3	3.2
41-50 Years	15	15.8
51-60 Years	24	25.3
61-70 Years	35	36.8
71-80 Years	11	11.6
81-90 Years	2	2.1
Gender		
Male	61	64.2
Female	34	35.8
Mode of Identification of COVID status		
Active Surveillance	1	1.0
Passive Surveillance	49	51.6
Patient come for the Treatment of other Morbidity	45	47.4

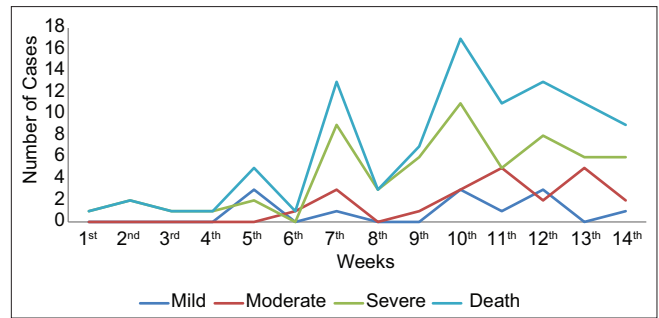
week. Among the referred cases, 22 cases (34%) were referred on ventilator support. Week-wise, referral cases with ventilator support increased from two in the 7th week to six in the 10th week and then decreased to two in the 14th week. Delay in seeking treatment at health centers showed An increased in number up to 9 on 7th to 9th week and on the last two weeks of the study, otherwise remained at zero to two. Next of kin of the deceased revealed being unaware of the condition (1%) and the stigma associated with the disease (32%) as the reasons behind the same [Graph 1].

Sixty-one (64%) deceased were admitted in severe condition directly in ICU while 22 (23%) were admitted in moderate condition and 12 cases (13%) in mild condition. Week-wise admission of severe cases increased from one in the first week to 11 in the 10th week and then decreased to six in the last week of the study duration. Likewise, the week-wise admission of moderate cases increased from one in the sixth week to five in the 11th week and then decreased to two in the last week of the study duration. Admission of mild cases remained one to three per week for the study duration [Graph 2].

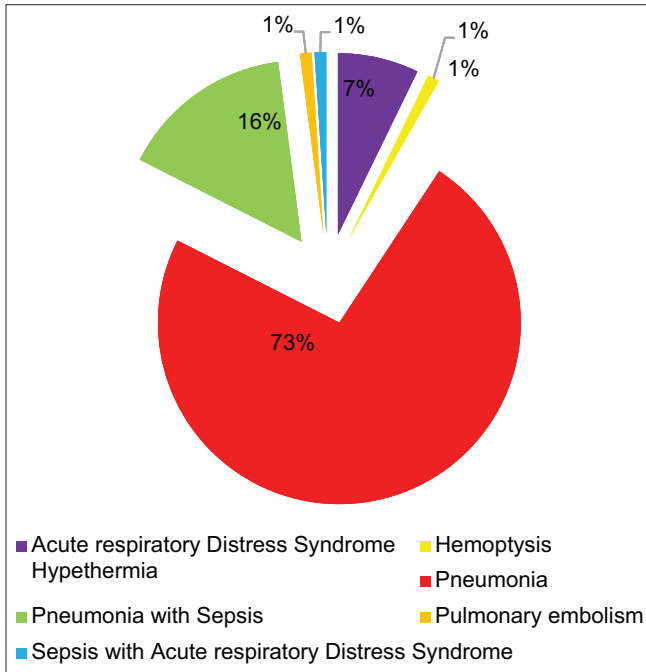
Common direct causes of death were found to be pneumonia (73%), pneumonia complicated with sepsis (15%), and acute respiratory disease syndrome (ARDS) (7%). Other direct causes of death were pulmonary embolism, hemoptysis, ARDS complicated with sepsis, pneumonia with myocarditis, pneumonia with encephalopathy, and hyperthermia (all 1% each) [Graph 3].



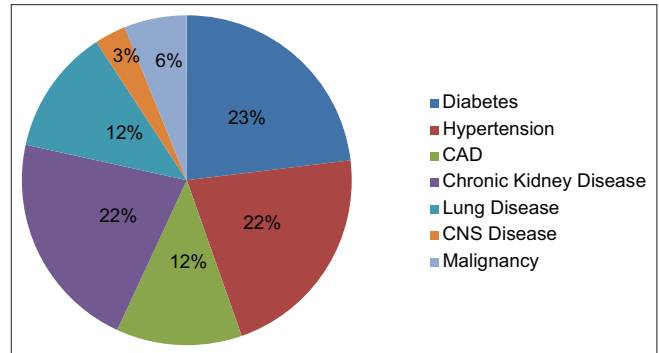
Graph 1: Week-wise trend of factors contributing to death



Graph 2: Week-wise trend of the severity of the cases at the time of admission



Graph 3: Direct cause of death



Graph 4: Associated co-morbidities at the time of admission

Sixty-five deceased (68%) were having comorbidities at the time of admission. Reported comorbidities were diabetes (23%), hypertension (22%), chronic kidney disease (22%), chronic lung disease (12%), coronary artery disease (12%), various malignancies (6%), and central nervous system disease (3%) alone or in combination with each other [Graph 4]. In 29 deceased two or more comorbidities were present and the most common was hypertension with diabetes mellitus (19 cases). Other multiple comorbidities were chronic obstructive pulmonary disease with hypertension and diabetes mellitus; chronic kidney disease with anemia, with hypertension, with hypertension and tuberculosis, and with hypertension and diabetes mellitus; coronary artery involvement with diabetes, and with hypertension and diabetes; and cerebrovascular accident with hypertension and diabetes.

Discussion

The present study was conducted in a tertiary level designated COVID-19 hospital (DCH) which is a referral center for the whole district. During the study period, daily admission was 70 to 100 patients.

CFR seems increasing drastically During the months of June and July, that is, from 3.1% to 8.5%, which is far more than the state CFR 1.4%.^[4] This finding could be explained by the fact that during the month of April and May, the hospital was admitting all types of COVID-19 patients including asymptomatic and mild. But after May, as directed by the Centre and State governments, home isolation was promoted and corona care centers (CCC), as well as dedicated corona health centers (DCHC), were made functional leading to the admission of only moderate to severe patients in this institute. This resulted in a low admission rate of mild cases and an increased number of admissions of patients having a greater risk of mortality in the hospital after the month of May. Another reason could be the increased number of referrals of the patients from other health care centers, that too, in severe condition, some of them on a ventilator. Delay in seeking treatment at the health center was also could be another reason. Next of kins revealed that about one-third of the deceased was delayed in seeking treatment at health centers and all of them, except one, were because of the stigma associated with the disease. These findings suggest that increased mortality in the referral center, such as ours, could be because of the severity of the deceased and not merely because of the want of quality of management.

The mortality rate of ICU varied 25--53%, which is not unusual compared to other international studies.^[8] This higher mortality rate could be because of the severe condition of the patient requiring ventilator support compared to the patient in the general ward. In our institute, all the death occurred in the ICU as whenever the conditions of the ward patients deteriorated,

They were shifted to the ICU. Most of the deaths were in the older age-group of >40 years. Various international studies have also pointed out the older age-group as one of the factors, however, the age brackets vary country by country.^[9,10] Male cases were significantly more than female cases which are consistent with other studies.^[8,9]

The most common cause of death was pulmonary pathology such as pneumonia and ARDS and sepsis causing multi-organ failure, especially acute renal injury. Myocarditis and pulmonary embolism were also led to death in a few cases. These findings are consistent with other studies.^[10-14] About two-thirds of the deceased had comorbidities, especially hypertension and diabetes. Other comorbidities were coronary involvement, chronic kidney disease, chronic obstructive pulmonary disease, and malignancies which is also consistent with other studies.^[11,15,16]

To find out COVID-19 cases, active as well as passive surveillance was conducted in the district. Most of the international studies talked about active surveillance and their effect,^[17,18] however, passive surveillance at Flu clinics and surveillance during the treatment of other diseases were the most productive in our scenario. Only one death case was found of the active surveillance by the door to door survey.

The study revealed that stigma, lack of awareness regarding SARS-COVID coinfection among general population and primary level healthcare providers are the reasons behind the delay in treatment. The stigma associated with the disease is prevalent in developing countries such as ours.^[19,20] In this study, about one-third of the deceased were late in seeking treatment (to any health center) because of the stigma attached to it. The most common fact was the state mandate quarantine of the primary contacts of the case, which was ensured by pasting a warning notice in a prominent area of the house, which stigmatizes the whole family. The stigma associated with the disease needs to be reduced to properly implement COVID-19 control measures.^[21,22] In addition, public unawareness about the disease symptoms, availability of treatment modalities for SARS-COVID co-infection and designated health facilities played an important role in the delay. Furthermore, lack of awareness among primary health care providers about this new disease and designated health facilities has led to unnecessary referrals from one center to the other, resulting in delayed testing and treatment. Capacity building, in terms of knowledge, attitude and perceptions, of these primary health care providers is essential in empowering them to initiate early treatment and timely referral to appropriate higher centers. This will go a long way in reducing morbidity and mortality.^[23,24]

Conclusion

This study concludes that the quality of hospital services should not be judged by the number of fatalities only, high CFR in the ICU of a referral COVID-dedicated hospital is mainly because of the admission of severe patients. To avoid delayed diagnosis

and treatment, the stigma associated with the disease needs to be ameliorated and capacity building of primary healthcare providers is must.

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Conflicts of interest

There are no conflicts of interest.

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