

The Impact of COVID19 on the Number of Dead-on-Arrivals (DOA) During the Pandemic at a Tertiary Care Hospital



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Abstract

Background: This study aimed to assess the impact of the COVID-19 pandemic on cases of Dead on Arrival (DOA).

Methodology: A retrospective chart review was conducted on all DOA files and electronic records from January 2019 to December 2020 in a tertiary care hospital in Karachi, Pakistan. The study compared the number of DOA cases before and during the COVID-19 pandemic and estimated the proportion of DOA cases that tested positive for COVID-19. Excess mortality for 2020 was calculated using linear regression with data from the previous five years.

Results: Out of 950 DOA cases, 442 were recorded before the pandemic and 508 during it. The mean age of the deceased was 57.51 (± 24.12). Among the 508 deaths during the pandemic, only 38 cases underwent COVID-19 testing, with 5 (13.1%) testing positive ($p=0.864$). The expected number of DOA cases for 2020 was 454, whereas the reported number was 508, indicating an excess of 54 cases.

Conclusion: The study suggests an increase in DOA cases in 2020, possibly attributable to the ongoing COVID-19 pandemic.

Keywords: COVID-19; Dead on Arrival; emergency; pandemic

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Introduction

Since the coronavirus 2019 (COVID-19) outbreak and the subsequent pandemic, healthcare systems have been globally seen extensive changes (1). Later on there was a dramatic fall in the number of patients attending ED in 2020 than compared with similar periods in years 2019 or 2018 (2). Delays in seeking healthcare facility was also observed in the first & second wave of COVID19 where ED was at <10% & <50% respectively, of its total capacity but on the other hand rates of admission in intensive care unit increased, suggesting adverse effects of potential delay to presentation (3).

Since the onset of COVID-19 pandemic, multiple strategies have been made to limit the spread of infection. Lockdown at national level in multiple countries also resulted in decreased ED attendance (4, 5). Subsequently, many states enacted stay-at-home orders to slow the spread of SARS-CoV-2, the virus that causes COVID-19 and reduce the burden on the health care system leading decrease in ED visits (6). The ED perceived

as a hotspot for transmitting infection because of he high risk of exposure, as it acts as a frontline in the pandemic's response (6). Along with the contagious nature of COVID-19, patients were advised to isolate themselves at home and get virtual visits via telemedicine. This evidence suggests that because of the fear of getting an infection people avoided ED visits for non-coronavirus-related illnesses and delayed their visits as long as possible (7, 8).

On the other hand, the focus of medical decision-making shifted from achieving the best outcomes for individual patients to addressing the immediate care needs of larger groups of patients, this was done in resource limitations, especially in the developing countries, add more problems to this situation, such as availability of beds in the hospital, especially in ICU and in the emergency department, shortage of healthcare providers, including nurses, doctors, and other paramedics staff, and hospital supplies, all these limitations led hospital facilities to adopt crisis standards of care, the most extreme operating condition for hospitals (9). These might significantly increase the morbidity and mortality

rate, especially those with life-threatening conditions (10). Therefore, we hypothesize that these multiple factors that lead to delays in getting timely medical aid in resource limitations, and disease nature itself can cause an increase in DOA presentation in ED. We conducted a single-center study to determine the impact of COVID-19 on DOAs and comparing the number of DOAs presented in ED before and during the pandemic.

Methodology

Study design and settings

We conducted a retrospective chart review of all DOA patient using files and their electronic records from January 2019 till December 2020 presenting to the emergency department of Aga Khan University Hospital, Karachi Pakistan. A total of 950 files were reviewed.

Eligibility Criteria

Included patients who were DOA between January 2019 till December 2020 before and during the COVID-19 pandemic to estimate how many DOAs turn out to test positive with COVID-19.

Variables and tool

Information was collected as per a structured questionnaire developed for this purpose, content validity was checked by four experts which was 0.72 and Cronbach alpha was calculated for reliability which was 0.77. The tool includes independent variables such as age, gender, time of arrival in ED, witnessed or unwitnessed collapse, underlying disease status, comorbid condition of the patient, functional class of patient, any COVID related symptoms, and exposure to the COVID positive patient. The outcome was DOA.

Data Management and Statistical Analysis:

The data were double entered in STATA 16, and data entry errors were removed. Frequencies and percentages were calculated for qualitative variables such as age groups, gender, comorbid conditions, and outcome. The quantitative variable was calculated in terms of mean and standard deviation. To gather the different comorbidities, the Chi-square test was applied. The monthly mortality rate was computed by dividing the number of deaths in a given month by the total number of patients registered in ED cases. An independent t-test was applied for the comparison of duration of CPR with DOA during and before COVID-19. Comparison of outcome and nasal swab results was analyzed using fisher exact test by keeping p-value < 0.05 as significance. We calculated expected death for the year 2020 by liner regression.

Results

A total of 950 dead on arrival (DOA) were reported during

the period of 2019 till 2020, out of which 442 were recorded before the pandemic period while 508 were recorded during the pandemic period. The mean age of the deceased was 57.51 ($\pm$ 24.12), with the majority falling in the age group of sixty to eighty years. Most were male in both the groups, while 354 [54.2%] of cases were witnessed collapse overall. The topmost three comorbid conditions were hypertension (696 [73.2%]), diabetes (511 [53.7%]), and ischemic heart disease (IHD) (240 [25.2%]) in both groups, with IHD being more significant before the pandemic (table:1).

Table 1: General characteristic and comorbid death conditions on arrival (DOA) patients

Total	Total n=950	Study Group		p- value
		Before Pandemic n=442	During Pandemic n=508	
Age in Years	57.51 (± 24.12)	57.87 (± 21.93)	57.7 (±22.99)	0.841
Age Groups				
<40 Years	189 [19.9%]	85 [19.2%]	99 [19.4%]	0.801
41-60 Years	231 [24.4%]	121 [27.3%]	132 [25.9%]	
61-80 Years	401 [42.2%]	182 [41.1%]	212 [41.7%]	
81-97 Years	129 [13.5%]	54 [12%]	65 [12.7%]	
Gender				
Male	560 [58.9%]	243 [54.9%]	315 [62.0%]	0.048*
Female	390 [41.0%]	199 [45.0%]	193 [37.9%]	
Comorbid				
Malignancy	195 [20.5%]	95 [21.4%]	101 [19.8%]	0.685
COPD	29 [3%]	13 [2.9%]	16 [3.1%]	0.876
DM	511 [53.7%]	221 [50%]	291 [57.2%]	0.286
HTN	696 [73.2%]	321 [72.6%]	375 [73.8%]	0.916
IHD	240 [25.2%]	133 [30%]	106 [20.8%]	0.046*
CVA	87 [9.1%]	438 [99%]	46 [9%]	0.934

Table 2 compares the CPR status performed on DOA before and during the pandemic. CPR was given to 138(31.2%) before pandemic while 122(24%) during pandemic (p=0.044). There was also a significant reduction in the total duration of CPR performed during the COVID period compared to CPR performed before the pandemic. However, there was no such difference in shock received by patients during code.

Table 2: Comparison of Cardiopulmonary resuscitation (CPR) status between before and during the pandemic.

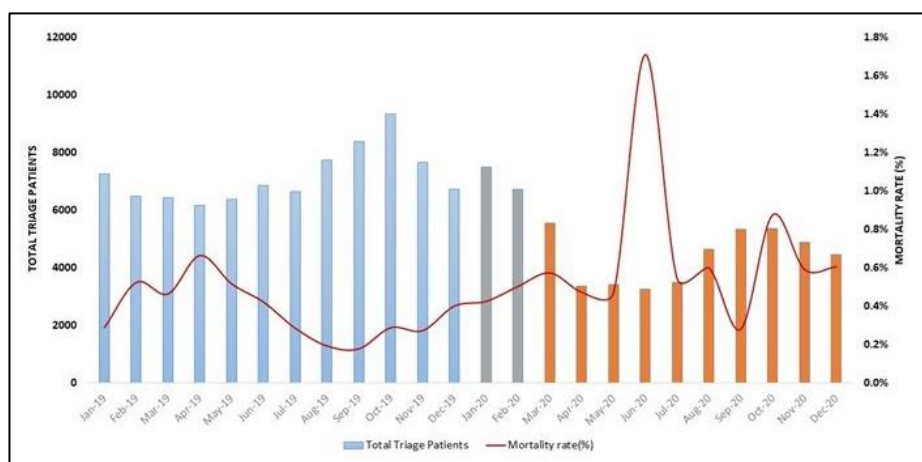
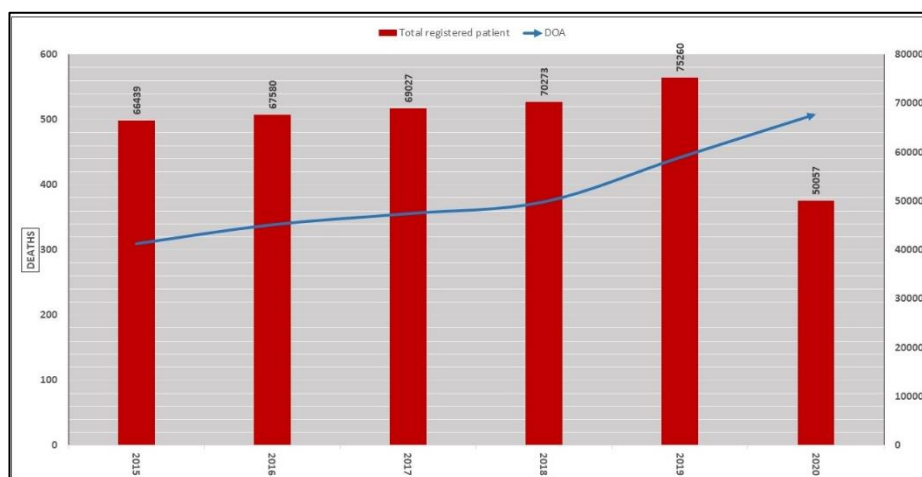
CPR status	Total	Study Group		p-value
		Before Pandemic	During Pandemic	
	950	442	508	
CPR given	260(27.3%)	138(31.2%)	122(24%)	0.044
Duration of CPR	16($\pm$ 9)	16($\pm$ 8)	10($\pm$ 9)	<0.001*
Shock delivered				
Yes	26(14.6%)	16(16.5%)	10(12.3%)	0.435
No	152(85.4%)	81(83.5%)	71(87.7%)	

In table 3, out of 508 cases reported during the pandemic, in only 38 cases, the COVID swab was sent out, of which five turned out positive. The questionnaire also includes a few questions about COVID related symptoms, such as if a deceased person had any of these symptoms during recent days or came across any COVID positive person. There were no COVID related symptoms reported in most cases, and in only two points, they reported exposure to the COVID positive person before their expiry.

Table 3: Shows COVID related symptoms in DOAs during the pandemic.

COVID related symptoms	Number of DOA during the pandemic period n=508
Fever	41 (12%)
Cough	134 (39.3%)
Flu	30 (8.8%)
Body weakness	212 (62.2%)
Sore throat	11 (3.2%)
Exposure to COVID positive person	2 (0.6%)
COVID swab send	38 (11.1%)
Positive Results *	5 (13.1%)

Figure 1 shows the comparison of death on arrivals before and during the COVID pandemic. Keeping January 2020 and February 2020 as a grey zone during that period COVID pandemic was not officially announced. There is a gradual increase in mortality rate from the start of the year 2020, and maximum it touches to 1.7% during June when the COVID first wave was disastrous in our region. Later in succeeding months mortality rate remained high during the COVID-19 pandemic period. (See figure 1).

**Figure 1: Trend of total triage patients along with mortality rate from a period of January 2019 till December 2020****Figure 2: Trend of total registered patients along with mortality rate from a period of the year 2015 till the year 2020**

Discussion

This study aimed to see the impact of a COVID pandemic on death on arrival (DOA) patients presenting in our hospital's emergency department. We found that the number of DOA has increased during the pandemic period. We also found out that there was almost twice the number of DOA seen amongst the 60-80 years of age group during the pandemic compared to the pre-pandemic period, suggesting that mortality with COVID-19 has affected the elderly population the most. There could be many potential reasons for this increase in DOA. The incidence of out of hospital cardiac arrest (OHCA) has been reported almost double during the specified pandemic period compared to the equivalent period of previous years, raising the possibility of an increase in the number of dead patients on arrival when reached hospitals (11). Respectively, the outcome and severity of COVID-19 largely depend on a patient's age. Adults over 65 years of age represented 80% of hospitalizations and had a 23-fold greater risk of death than those under the age of 65 (12). The geriatric population was affected with higher rates of mortality and morbidity as the social isolation and loneliness significantly worsened. (13). During the pandemic, all these factors worsened, late access to the call for help amongst these people, ultimately resulted in higher DOA (14).

Our study also highlights that both before and during the pandemic, comorbid conditions including hypertension, diabetes mellitus, and ischemic heart disease remained the most seen comorbidities amongst patients who were declared DOA in ER. Patients with these diseases are at a higher risk of getting COVID and have a higher mortality rate than those who do not have these comorbid conditions. (15). In a study by Riccardo in May 2020, it was found that, amongst the patients admitted due to COVID -19, patients with cardiac comorbidities had higher mortality (36% vs. 15%) and had significant events (57% vs. 21%), as compared to the non-cardiac patients. The severity and fatality of COVID-19 was also impacted by diabetes (16).

As compared to 31.3% of patients who received CPR before the pandemic, only 24% received CPR during the pandemic. Also, the CPR time duration was reduced from 16 minutes to 10 minutes. The possible reason for this decrease in the number of patients who received CPR and the reduction in CPR duration are multifactorial. The fear of getting exposed to COVID patients while attempting for resuscitation among healthcare workers was very high, and pandemic had caused a shortage of health care workers as well (17). As a result, more minor patients received CPR in the hospital. The delays associated with donning personal protective equipment (PPE) and less experienced code-team members during times of staffing shortages may further reduce the likelihood of success (18). Giving chest compressions with continuous wear of N95 mask doubled layered the plastic gowns, and the eye shield goggles become exhausting which led to compromises in the quality of CPR (19). To overcome these fear and anxiety issues and prevent the health care workers from acquiring the infection, few hospital setups made rules that resuscitation should commence only after the code team has donned appropriate PPE (18). The hospital in the USA also limited the resuscitation of OHCA. This resulted in a reduction of 46.1%

of hospitalizations and 29.2% of resuscitation attempts compared to Standard Care (20).

The study also shows that very few COVID testing swabs were sent for the patient's declared DOA. Most deceased attendants were reluctant and refused COVID testing to avoid difficulties in the funeral. Although the positivity rate was 13.1% in our study, those COVID tests were done. A significant proportion of DOA had positive symptoms for COVID, with 62.2% having body weakness 39.3% having cough, the two primary symptoms. Therefore, a valid assumption could be made of a much higher rate of COVID positive patients in DOA.

We also compared every month's DOA with the previous year. After April, the excess mortality rate was positive, with a maximum of 1.7% in June 2021, the peak month of the first wave in Pakistan. Moreover, during this month, the number of triage patients was also the least of the year, reflecting the drop-in visits by patients to ER. This decrease in ER visits during the pandemic period was also reported in several other studies (21, 22).

This study is one of the studies in Pakistan who have compared DOA pre and during COVID-19 pandemic. This study has used a large sample size and checked medical records to avoid recall bias and selection bias. Despite the strengths the significant limitation is this was conducted at a private tertiary care setup, so its generalizability is limited only to private setups. The design cannot determine the causality therefore it is uncertain whether COVID-19 exposure caused more deaths or not?

Conclusion

Our study shows a significant increase in DOA in 2020, which might be attributable to an ongoing COVID-19 pandemic. Certain factors combining with COVID-19 caused this increase in mortality which includes age and comorbidities. There was almost twice the number of DOA seen amongst the 60-80 years of age group and people with comorbidities during the pandemic compared to the pre-pandemic period. Large multicenter studies are required to see its impact on greater population and also the factor contributing in of DOA should be explored in future studies.

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Ethical Approval:

This study was approved by ERC of Aga Khan University Hospital, Karachi, Pakistan.

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Authors' Contribution:

FA, SMS, NNK: Conceptualization, Supervision and Writing, reviewing & editing

SHH, SS: Methodology, Data curation and Writing, reviewing & editing

AR: Data analysis

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