IMMEDIATE AND CONTRIBUTORY CAUSES OF DEATH IN PATIENTS HOSPITALIZED WITH COVID-19

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BACKGROUND

- Current mortality rates from COVID-19 may represent under- or over-estimation of the numbers and rates, as the mild or asymptomatic cases may not be tested or reported, and cause of death may not be accurately identified.
- A large proportion of deaths in patients with COVID-19 occur among those with other significant comorbidities.
- In such cases, it is difficult to ascertain whether COVID-19 or other comorbidities were the immediate underlying cause of death.
- Existing comorbidities can be exacerbated by COVID-19 infection and vice versa.
- It is important to know the number of patients who “die of COVID-19” as opposed to those who “die with COVID-19”, for public health, public policy, and clinical care decision-making purposes.

OBJECTIVES

- We conducted this study to determine the underlying and contributory cause(s) that caused the terminal event in patients with COVID-19.

METHODS

- The study was conducted in the State of Qatar between March 1, 2020 and August 31, 2022.
- All deaths in Qatar are evaluated and processed through a single public sector healthcare system with a unified electronic health records platform. All deaths that occurred in Qatar during the study period which were flagged by the mortality review team for likely relationship to COVID-19 by were evaluated.
- Each death thus flagged was evaluated by two independent physician reviewers trained to determine and assign the most likely immediate underlying cause of death.
- Cause of death was assigned based on the most plausible underlying event that triggered the event(s) that led to death through chart review.
- After the primary reviewers had assigned the immediate and contributory causes of death, they were categorized into major diagnostic groups by organ system, syndrome, or disease classification. A uniform categorization algorithm was used for all cases.

RESULTS

Characteristics of the decedents included in our study.

	n (N=749)	%
Median age (IQR), years	56 (47,83)	
Sex		
Male	572	76.4%
Female	176	23.5%
Missing	1	0.1%
Nationality[1]		
Qatari	146	19.5%
Southeast Asian	337	45.0%
Middle East and North Africa (MENA)	145	19.4%
Far Eastern	67	8.9%
African	44	5.9%
All others	9	1.2%
Missing	1	0.1%
Admitting diagnoses		
Respiratory tract infection	682	91.1%
MACE	17	2.3%
Malignancy	6	0.8%
Infection, other acute bacterial or viral	4	0.5%
Acute kidney injury	3	0.4%
Trauma, fracture, or burns	3	0.4%
Metabolic or electrolyte abnormalities	2	0.3%
Thromboembolism	2	0.3%
Liver failure, acute or acute on chronic	1	0.1%
Missing	22	2.9%
Other	7	0.9%
Vaccination status		
No dose received	596	79.6%
1 dose only	97	13.0%
2 doses	48	6.4%
3 doses	8	1.1%
Median (IQR) hospital length of stay, days (10 missing values were excluded)	23 (14,38)	

Immediate causes of death in patients with COVID-19.

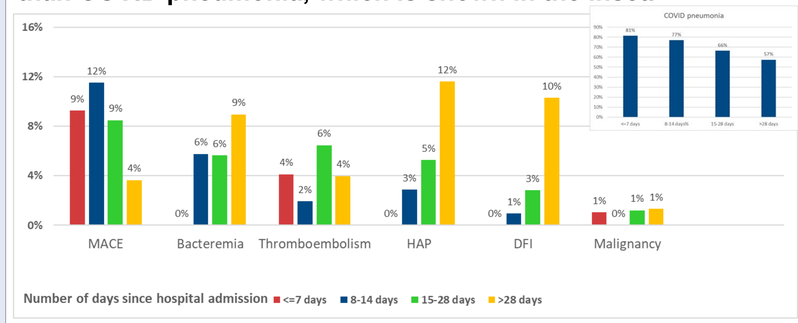
	Immediate cause of death N=749	
	n	%
COVID pneumonia	496	66.2%
Major adverse cardiovascular event	53	7.1%
Hospital associated pneumonia	51	6.8%
Bacteremia	47	6.3%
Disseminated fungal infection	39	5.2%
Thromboembolism	34	4.5%
Acute ischemia or bleeding	11	1.5%
Malignancy	8	1.1%
No consensus	8	1.1%
Trauma	2	0.3%

RESULTS (contd)

Causes of death by location in the hospital.

	ICU deaths n=648		Non-ICU deaths n=101	
	N	%	N	%
COVID pneumonia	426	65.7%	70	69.3%
MACE	45	6.9%	8	7.9%
Hospital associated pneumonia	44	6.8%	7	6.9%
Bacteremia	42	6.5%	5	5.0%
Disseminated fungal infection	37	5.7%	2	2.0%
Thromboembolism	31	4.8%	3	3.0%
Acute ischemia or bleeding	11	1.7%	0	0.0%
Metastatic cancer	6	0.9%	2	2.0%
No consensus	4	0.6%	5	5.0%
Trauma	2	0.3%	0	0.0%

Immediate cause of death by time of death after hospital admission. Main graph shows major causes of death other than COVID pneumonia, which is shown in the inset.



MACE, major adverse cardiovascular event; HAP, hospital associated pneumonia; DFI, disseminated fungal infection.

CONCLUSIONS

- A large proportion of patients with COVID-19 die of non-COVID causes, some of which are preventable.
- Early non-COVID deaths are most frequently due to MACE, while after 2 weeks, bacteremia, thromboembolism, hospital-associated pneumonia, and disseminated fungal infection become more frequent.
- Mitigation strategies should be instituted to reduce the risk of such deaths.

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