LETTER TO THE EDITOR

Predicting 1-year post-COVID-19 mortality based on chest computed tomography scan

To the Editor,

Post-discharge mortality in patients with coronavirus disease 2019 (COVID-19) is an important yet unraveled aspect of this disease. In a study in UK, mortality was reported to occur in 13.4% of patients with COVID-19 after discharge from hospital.[1]

In our study, we reviewed a total of 1078 patients with COVID-19 pneumonia who underwent chest computed tomography (CT) at Baqiyatallah Hospital, Tehran, Iran, and were hospitalized from March to April 2020.[2] Data were extracted from hospital registry records including age, sex, date of admission, date of discharge, history of readmission, mortality (in-hospital or out-of-hospital), and chest CT scan information including lesion distribution, opacity score and underlying disease (according to chest CT).

The mean age of study population was 53 ± 14.38 years, and 773 patients (68.4%) were men. The lesion type of 414 patients (38.4%) was only ground-glass opacification/opacity (GGO), 133 (12.3%) was GGO plus crazy paving, 42 (3.9%) was consolidation only, and 489 (45.4%) was GGO plus consolidation.

The mean opacity score was 6.13 ± 5.55. According to registry records, 29 patients (2.7%) had the history of readmission after discharge. The post-discharge mortality was assessed by telephone interview during the next 365 days (up to March 2021).

In-hospital mortality was 25 of 1078 (1.9%) and post-discharge mortality of patients was 97 of 1053 (9.2%) within 365 days of diagnosis. The most frequent causes of death were vascular and thromboembolic events. Age was a prognostic factor for long-term mortality in COVID-19 patients after discharge from hospital. Using a Cox regression model, the hazard of death in patients from 50 to 60 years was 2.03 more than patients under 50 years (95% CI, 1.15–3.58) and this hazard increased to 3.00 for patients over 60 years of age (95% CI, 1.75–5.16) (Graph 1).

Moreover, a Cox regression model was used to predict the mortality and post-discharge mortality, using chest CT, adjusted for age, sex, readmission, and diagnosed underlying disease (according to chest CT). According to the results, both opacity score and lesion type could predict the overall mortality and mortality after discharge
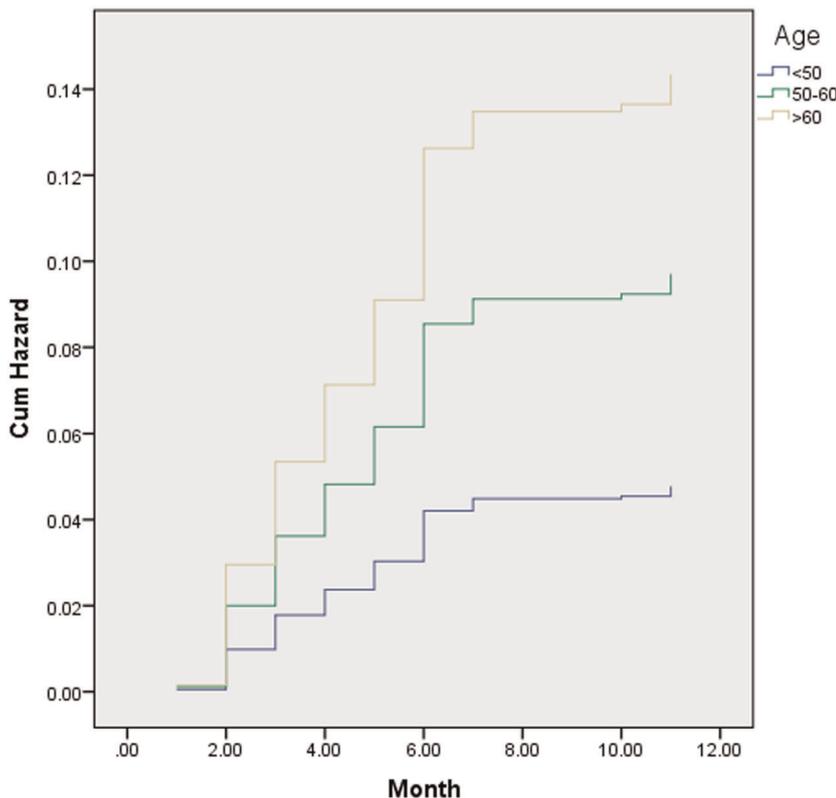
GRAPH 1 The cumulative hazard of mortality from one month of hospital discharge for patients with COVID-19, according to age group

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TABLE 1 Cox regression model to predict the mortality outcome in patients with COVID-19

	Total patients		Patients who followed after discharge from the hospital	
	HR[a] (95% CI)	p value	HR[a] (95% CI)	p value
Opacity score	1.15 (1.13–1.18)	<.001	1.12 (1.09–1.15)	<.001
Lesion type				
GGO plus consolidation	Ref		Ref	
Only GGO	2.47 (1.64–3.72)	<.001	2.11 (1.13–3.92)	.018
GGO plus crazy paving	2.22 (1.26–3.92)	.006	1.86 (1.16–3.01)	.01
Only consolidation	1.77 (0.62–5.06)	.286	0.50 (0.07–3.72)	.50

Abbreviations: CI, confidence interval; GGO, ground-glass opacification/opacity; HR, hazard ratio.
[a]Adjusted for age, sex, underlying diseases, and readmit to hospital.

in COVID-19 patients (Table 1). As opacity score increased, the hazard of death was concordantly increased. In patients with lesion types of only GGO or GGO plus crazy paving, there was a significantly higher hazard of mortality compared to patients with GGO plus consolidation.

In conclusion, COVID-19 patients discharged from hospital are still at the risk of mortality, specifically for those with higher opacity score and GGO or GGO plus crazy paving lesion type. GGO is a sign of the early and active stage of the disease that can progress and worsen patients' health but the appearance of consolidation opacities is a sign of proper activity of the immune system. Moreover, CT scan images of GGO and GGO with consolidation combined with COVID-19 pathological findings including hyaline membrane formation and increased inflammatory exudate of the alveolar space are associated with increased mortality in patients.[3] Finally, the hazard of long-term mortality in elderly patients who are discharged from hospital has also been reported to be higher in another study.[4] To sum up, these findings suggest increased attention should be paid to identify and monitor patients who are discharged from hospital but still remain at a high risk of death.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Mohamad Amin Pourhoseingholi and Amir Vahedian-Azimi conceptualized the study. All authors contributed to data analysis, writing, and revision of the manuscript. All authors approved the final version.

DATA AVAILABILITY STATEMENT

Data are available from the corresponding author on a reasonable request.

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