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COVID-19 information note 15

Survival analysis of critically ill patients with COVID-19 admitted to hospital in Somalia: how important was oxygen?

On 16 March 2020, the Federal Ministry of Health and Human Services of Somalia reported the country's first laboratory-confirmed case of coronavirus disease 2019 (COVID-19) in a Somali student arriving from China. Since then and until 31 October 2021, the country has officially reported 22 369 laboratory-confirmed cases of COVID-19, including 1238 associated deaths. Among the reported laboratory-confirmed COVID-19 cases, about 16% were admitted to different isolation centres designated by the government and supported by WHO and other international agencies. Because of a lack of consistent data, it is not clear how many of these patients required critical care support. One study showed that between 23 April and 28 June 2020, of 443 patients with confirmed infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) admitted in a large tertiary-level hospital in Mogadishu, only 48 (11%) patients with severe symptoms were admitted to the intensive care unit[1].

To address this data gap, the WHO country office, together with Alliance for Health Policy and Systems Research[2], supported a study in Somalia which looked at the survival probability of severely ill COVID-19 patients receiving various interventions in a public sector hospital. The study has been accepted for publication in the International Journal of Infectious Disease (preprint available at https://authors.elsevier.com/sd/article/S1201-9712(21)00865-1).

Highlights

- Survival analysis of 131 patients with SARS-COV-2 in Somalia was conducted.
- Interventions to improve outcomes in low-resource and fragile settings were examined.
- Risk factors for death included age ≥ 60, cardiovascular disease and use of non-invasive ventilation.
- Patients receiving oxygen only were more likely to survive than those ventilated.
- Optimizing critical care for COVID-19 in fragile states needs policy discussion.

[1]Mohamud MFY, Hashi AS, Mohamed AH, Yusuf AM, Ali IH, Ahmed MA. Clinical characteristics, comorbidities, initial management and outcome of COVID-19 infected patients admitted to intensive care unit in Somalia: a national retrospective study. Research Square preprint; https://doi.org/10.21203/rs.3.rs-66767/v1

[2]The Alliance is supported through both core funding as well as project specific designated funds. The full list of Alliance donors is available here: https://ahpsr.who.int/about-us/funders

World Health Organization
Somalia

Study aim: looking for evidence of what works in low-resource settings

The main aim of the study was to assess the clinical characteristics of patients with COVID-19 admitted to a main public sector hospital in Somalia, estimate the length of hospital stay and identify the risk factors for in-hospital death in these patients. The study also assessed what interventions might help to improve clinical outcomes in patients with severe COVID-19 in low-resource and fragile settings.

The study included 131 severely ill COVID-19 patients who required critical care admitted to the hospital from 30 March to 12 June 2020 – the first 3 months of the pandemic in Somalia.

Study findings: age ≥ 60, cardiovascular disease and non-invasive ventilation associated with death

Study findings

- Average length of hospital stay for the patients was 7.7 days, range of 1–35 days.
- 90 (69%) patients were male with a mean age of 58.5 years versus 56.9 years for females.
- 52 (40%) patients died and 79 (60%) survived.
- The main factors associated with in-hospital death were:
  - being older than 60 years,
  - having cardiovascular disease, and
  - being administered non-invasive ventilation on admission or delayed non-invasive ventilation as a response to worsening symptoms (patients who were not ventilated but received oxygen only were more likely to survive than those who were ventilated).
- The survival probability of patients who were given medical oxygen only was 75% higher at day 7 after admission, and consistently remained at over 70% even at day 14, than patients treated with both oxygen and non-invasive ventilation.
- The risk of death for patients given non-invasive ventilation with medical oxygen was 5.43 times higher than in patients given only oxygen.

What this study adds: noncommunicable diseases contribute to higher probability of death

So far, data on epidemiological and clinical characteristics of severely ill-patients with SARS-CoV-2 infection in Somalia have been lacking. This study provides the first peer-reviewed evidence from a fragile setting describing the characteristics and critical care needs of patients with acute respiratory distress. This information has policy implications in terms of identifying needs and building an appropriate level of care and services for managing critically ill patients in Somalia with respiratory diseases, especially those that can cause epidemics.

The most common symptoms in both men and women were fever, shortness of breath and cough. Over 90% of men and women had abnormal lung X-ray findings and lung auscultation, and dyspnoea/tachypnoea. While most patients had no comorbidities, the most common comorbidities in both men and women were cardiovascular disease (40%) and diabetes (40%). Cardiovascular disease was reported mainly in patients aged 40 years or older. Diabetes was more common in females (48%) than males (36%).

An important finding was that cardiovascular disease significantly increased the likelihood of death, especially in those 60 years or older. About half of the patients with cardiovascular disease survived the first week of hospitalization compared with three quarters of patients without cardiovascular disease. A similar pattern was seen in patients with diabetes, although the likelihood of death was lower (Table 1).

The use of vasopressors and inotropes did not reduce the risk of death as patients who received such treatment had very low probability of survival compared with those who were not given this treatment

Use of oxygen: did it improve survival?

Another important finding of this study was that patients who were not ventilated on admission and received only oxygen had a higher probability of survival than those who were ventilated on admission (Table 2) and (figure 1). Those who were ventilated on admission had a 22% probability of survival on day 3 compared 83% in those who were not ventilated. None of the patients ventilated on admission survived after day 4 (Table 2).

All patients who received delayed non-invasive ventilation as a response to worsening symptoms did not survive beyond day 16 either. Overall, patients who were not ventilated but received medical oxygen only had a significantly higher probability of survival than those who were ventilated on admission.

The likelihood of death for females and males by ventilation status was also estimated in the study. The likelihood of death in female patients who were ventilated on admission was higher than in males.

Table 1. Survival probability according to patient characteristics and treatment on day 7, 14 and 21 after admission to hospital, Somalia, 2020

Variable	At day 7 Survival probability (95% CI)	At day 14 Survival probability (95% CI)	At day 21 Survival probability (95% CI)
Age group (years)			
< 60	0.789 (0.658–0.874)	0.789 (0.658–0.874)	0.789 (0.658–0.874)
≥ 60	0.489 (0.365–0.602)	0.440 (0.312–0.561)	0.339 (0.205–0.478)
Sex			
Female	0.669 (0.497–0.794)	0.669 (0.497–0.794)	0.535 (0.254–0.752)
Male	0.600 (0.487–0.696)	0.557 (0.436–0.662)	0.488 (0.348–0.613)
Cardiovascular disease			
No	0.719 (0.601–0.807)	0.697 (0.574–0.790)	0.558 (0.379–0.704)
Yes	0.478 (0.332–0.610)	0.425 (0.265–0.576)	0.425 (0.265–0.576)
Diabetes			
No	0.704 (0.585–0.795)	0.684 (0.561–0.779)	0.547 (0.372–0.693)
Yes	0.499 (0.353–0.629)	0.449 (0.290–0.596)	0.449 (0.290–0.596)
Inotropes or vasopressors			
No	0.769 (0.670–0.842)	0.728 (0.614–0.813)	0.655 (0.508–0.768)
Yes	0.107 (0.027–0.251)	0.107 (0.027–0.251)	0.000 (0.000–0.000)

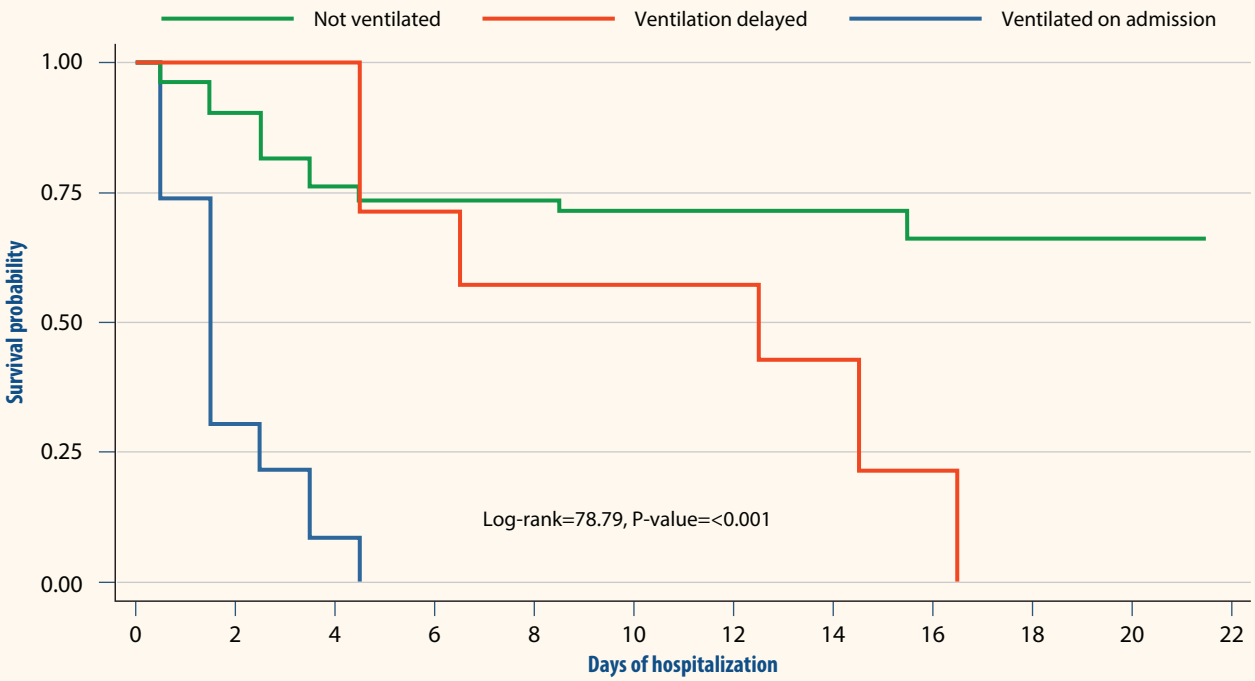
CI: confidence interval.

Table 2. Survival probability according to time after admission, by administration of non-invasive ventilation, Somalia, 2020

Length of time after admission, days	No ventilation Survival probability (95% CI)	Delayed non-invasive ventilation Survival probability (95% CI)	Non-invasive ventilation on admission Survival probability (95% CI)
1	0.966 (0.899–0.989)	1.000 (1.000–1.000)	0.739 (0.509–0.873)
2	0.910 (0.827–0.954)	1.000 (1.000–1.000)	0.304 (0.135–0.493)
3	0.828 (0.731–0.893)	1.000 (1.000–1.000)	0.217 (0.079–0.399)
4	0.778 (0.675–0.853)	1.000 (1.000–1.000)	0.087 (0.015–0.242)
5	0.753 (0.647–0.832)	0.714 (0.258–0.920)	
7	0.753 (0.647–0.832)	0.571 (0.172–0.837)	
9	0.737 (0.627–0.819)	0.571 (0.172–0.837)	
14	0.737 (0.627–0.819)	0.429 (0.098–0.734)	
15	0.737 (0.627–0.819)	0.214 (0.012–0.586)	
16	0.698 (0.564–0.798)	0.214 (0.012–0.586)	
21	0.698 (0.564–0.798)		

CI: confidence interval.

Fig.1: Kaplan-Meier survival estimates by ventilation use



Implications of findings: oxygen needs to be available in hospitals in Somalia to treat COVID-19

Like many other African countries, Somalia has not reported a very high number of cases and deaths from COVID-19. Given the fragility of the health care system in Somalia, it was anticipated that the system would be overwhelmed by the COVID-19 pandemic because it occurred at a time when the country had no intensive care beds, no ventilators and no central supply of medical oxygen in the public sector. Ranked 193 out of 195 countries on the Global Health Security Index, Somalia's health system, considered the second most fragile in the world, has been debilitated by decades of civil war, insecurity and disease outbreaks, as well as natural disasters such as droughts and floods, all of which have led to a deterioration in health outcomes. The universal health coverage index of Somalia, as a measure of effective health service coverage and its contribution to improved health outcomes of all its people, is the lowest in the world – 25 out of 100. The current health workforce density in Somalia (0.34 health care workers per 1000 population) is substantially lower than the density needed for universal health coverage (UHC) – 4.45 health care workers per 1000 population by 2030. At the time the epidemic hit the country, there were only 15 intensive care unit beds (all in the private sector) for a population of more than 15 million.

Although data are available from high- and middle-income countries on the clinical characteristics of COVID-19, outcomes and risk factors for clinical outcomes, few studies investigating the links between interventions and clinical outcome have been published from less developed countries. Therefore, this WHO-supported study in Somalia is a useful contribution to the literature and body of evidence, especially as it comes from a low-resource setting. Documenting the length of hospitalization and survival of patients with COVID-19 and the risk factors associated with death in low-resource settings could provide a better understanding of the impact of the disease, the usefulness of medical interventions and the needed hospital capacity to cope with a surge in COVID-19 patients in such settings. This information can also guide policy responses on the use of low-cost, high-impact interventions in such setting to save lives and manage a surge in cases.

Two findings of this study need emphasizing: (i) the survival probability of patients who were given medical oxygen only was 75% higher at day 7 after admission, and consistently remained at over 70% even at day 14, than patients treated

with both oxygen and non-invasive ventilation; and (ii) the risk of death for patients given non-invasive ventilation with medical oxygen was 5.43 times higher than in patients given only oxygen. These findings have important policy implications.

As the COVID-19 pandemic spread throughout the world, there was concern that the infection would have a substantial impact on African countries because they were unprepared to deal with such a crisis. However, the level of preparedness was judged by the number and availability of intensive care beds and ventilators per millions of people use. Our study showed that ventilators, although useful for patients suffering from severe symptoms, are not a feasible treatment in countries where skilled and trained staff, such as specialized nurses and doctors to manage intensive care units and ventilators, are not available, as was the case in the hospital where this WHO-supported study was conducted. Using hastily supplied ventilators with limited training can lead to improper use, discomfort and even death in patients

As reported in most sub-Saharan African countries and also in Somalia (COVID-19 information note 9[3]), medical oxygen in secondary and tertiary health care settings is not always available, even though it is a recognized and fundamental therapy for treatment of acutely ill patients. Oxygen is especially beneficial in treatment of pneumonia, which is a leading cause of death in elderly people and children under 5 years. The usefulness of medical oxygen in the treatment of patients with COVID-19 is further evidence of the urgent need to ensure that medical oxygen is always available in these settings.

Conclusion: utilizing medical oxygen to reduce deaths from other high-burden diseases

This may be the first peer-reviewed evidence from a fragile and vulnerable health setting on risk factors for in-hospital deaths from COVID-19 and what interventions have proven successful where resources and capacities are limited. It is therefore critical to consider the risk factors found in this study – advanced age, presence of cardiovascular disease and use of non-invasive ventilation – when dealing with severe COVID-19 patients in an environment where trained and skilled health care workers to manage patients in high dependency units are limited and critical care services are rudimentary. By highlighting the value of available, accessible and affordable low-cost interventions in a fragile and resource-poor setting to inform case management of severe acute respiratory diseases, the study results have important policy implications. Thus, translating this evidence into policy practice and scaling up the availability of medical oxygen in Somalia will also improve access to care for childhood pneumonia and other respiratory diseases. In turn, this will result in improved outcomes in the form of lives saved and deaths averted as lower respiratory infections are the third leading cause of death and second leading cause of disability-adjusted life years for both sexes in Somalia.

[3] http://www.emro.who.int/images/stories/somalia/documents/covid-19-information-note-9.pdf?ua=1

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