



COVID-19 information note 4

Counting every breath: a data-driven strategy to improve access to medical oxygen for COVID-19 patients in Somalia

Availability of oxygen is a fundamental component of every secondary and tertiary level hospital in the health care system, especially for treating patients with medical emergencies and breathing difficulties. While oxygen is central to the management and care of such patients, only high-quality, medical-grade oxygen is recommended for patients suffering from severe symptoms of coronavirus disease-19 (COVID-19) as these patients suffer from low oxygen saturation. When the first laboratory-confirmed case of COVID-19 was reported on 16 March 2020 in Somalia and the outbreak was spreading through the country, none of the public sector hospitals in Somalia had medical oxygen available.

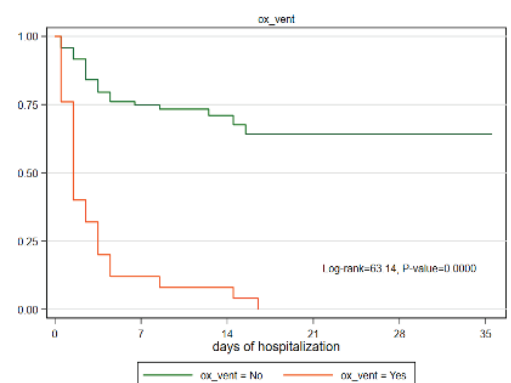
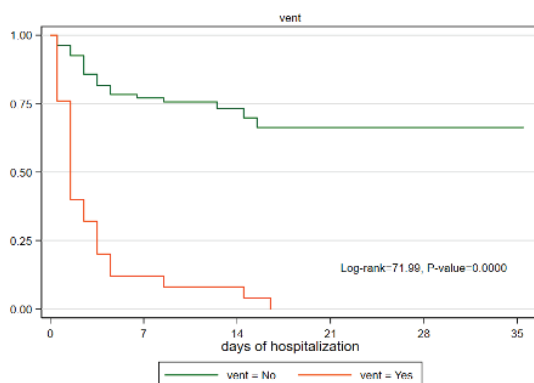
Conflict, civil war and humanitarian crisis have overwhelmed Somalia over the past few decades, resulting in fragility and underdevelopment in every social sector. The effect of the protracted crisis, fragility of health services and underfunding have led to underachievement of the health sector. The country's under-5 child mortality rate, neonatal mortality rate and maternal mortality ratio are far behind the levels they should be at in order to meet the 2030 Sustainable Development

Goals. The universal health coverage index – calculated as the number of people with access to quality essential health care services without financial hardship – is 25 out of 100. In the middle of this situation, the country has had to deal with the outbreak of COVID-19. This outbreak has not only tested the ability of the country's weak health system to respond to a fast-spreading infectious disease from a new pathogen against which there were no medical countermeasures available, but has also drawn attention to the gaps in the health sector and the need to understand and address them.

Scaling up oxygen availability: use of WHO inventory tool

As the outbreak of COVID-19 continued and the need for optimal case management of patients with severe infection emerged, the WHO Somalia country office quickly recognized that not only was there a severe shortage of medical oxygen in the country, but also that there were only a few companies in the private sector producing oxygen to fill cylinders. Where oxygen was available, it was very expensive – private suppliers were charging US\$ 100–200 for a large cylinder of oxygen. Data also

Survival probability of patients on oxygen vs ventilator : analysis of 133 patients admitted in De-Martini hospital, Mogadishu from 30 March to 15 June 2020



emerged from countries where outbreaks had occurred earlier that patients with severe COVID-19 symptoms had low oxygen concentration which necessitated the timely administration of medical oxygen. The therapeutic benefits on the use of invasive ventilation for these patients were also limited.

Given the situation, the WHO country office took the decision to scale up oxygen availability in all the isolation centres being set up across the country for treatment and care of patients with severe COVID-19. This was a challenging and ambitious undertaking, and a race against time.

Getting the data to devise a surge strategy

In order to determine the availability of oxygen in the country, the WHO country office together with the Ministry of Health and Human Services of the Federal Government of Somalia conducted a rapid assessment using WHO's biomedical equipment for COVID-19 case management – inventory tool¹ to determine the readiness of health facilities and to plan for a surge in demand for oxygen as the COVID-19 cases started to spike.

This assessment was conducted across the country in one week and covered 23 secondary-care hospitals – a minimum of two health facilities in each state. The purpose was to identify the gaps in oxygen supply so as to inform the development of a rational approach to scale up oxygen availability (Table 1).



Only 22% of health facilities and hospitals surveyed had staff trained on patient care using mechanical ventilation and intubation. Only 26% of the health facilities had at-least one oxygen source.

After collecting and validating the data, through facility visits and frequent communication and followed by rapid data audits, the report was finalized and formed the basis of a plan with a phased approach to scale up oxygen availability.

Phase 1: pulse oximeters and oxygen concentrators

The first phase focused on the procurement of pulse oximeters and oxygen concentrators to tackle immediate needs – and save more lives. The plan anticipated the need for: 360 oxygen concentrators (10 L, with accessories) with other medical consumables, 397 fingertip pulse oximeters and 90 000 high-flow nasal cannulas, with accessories. The WHO country office rapidly procured 76 oxygen concentrators together with other medical consumables and distributed these to all 16 isolation centres across the country to support case management of patients with COVID-19. Adopting this strategy in the initial phase was considered more appropriate given the skill sets of Somali health workers as just 22% of the facilities surveyed had staff trained in mechanical ventilation and intubation.

Phase 2: pressure swing adsorption oxygen generators

The second phase will focus on boosting the oxygen supply with pressure swing adsorption (PSA) oxygen generators², which were already under consideration before the COVID-19 outbreak. The WHO country office is procuring three PSA oxygen generators – for two facilities in Mogadishu and one in Hargeisa – with dedicated power generators. Upon the availability of funds, the WHO country office proposes to procure and install at least one PSA oxygen generation plant in each state.

Table 1: Findings of the survey

1	Number of health-facilities/hospitals assessed	23
2	Average number of beds in the assessed facility	166 (range: 10–450)
3	Number of intensive care beds	15 (range: 10–25)
4	Number of facilities with at least one oxygen source	6 (26%)
	• Facilities with oxygen concentrator only	1 (4%)
	• Facilities with oxygen cylinders only	5 (22%)
5	Number of facilities with staff trained on intubation and mechanical ventilation	5 (22%)
6	Number of facilities with staff trained on management of medical equipment	0 (100%)
7	Number of facilities with unusable piping for oxygen	6 (26%)
8	Number of facilities with pressure swing adsorption oxygen	0 (100%)
9	Number of facilities using bulk liquid tanks for oxygen	0 (100%)

¹The tool is used to collect in-depth facility inventories of biomedical equipment for procurement and planning for COVID-19 case management. The survey assesses quantified availability and the causes for non-functioning of different sources of oxygen delivery and supply systems to the patient in order to determine priorities and reallocation requirements in accordance with needs. Available at <https://www.who.int/publications/i/item/WHO-2019-nCov-biomedical-equipment-inventory-2020.1>

² PSA oxygen generating plants are a source of medical-grade oxygen for delivering high-grade medical oxygen for COVID-19 patients.

Survival of patients with severe COVID-19 at the De-Martini hospital, Somalia

A study conducted by WHO on the clinical characteristics, comorbidities and risk factors influencing the outcomes of 133 critically ill patients with COVID-19 admitted to the De-Martini hospital in Mogadishu clearly demonstrated that clinical interventions with non-invasive ventilation for patients with poor prognosis did not contribute to reducing the risk of death. About 85% of the patients receiving such intervention died within a week and 90% within two weeks, and none survived beyond three weeks after admission. One of the important findings of our study was the better clinical outcome of patients who were given medical oxygen only. A subanalysis of 121 patients showed that the survival probability of patients who had medical oxygen only was higher (75%) at day 7 and consistently remained at over 70% even at 14 days after admission.

Building back: recover stronger, recover better

WHO will closely follow up on the oxygen therapy programme and draw lessons from this investment. WHO would also like to recruit a biomedical engineer (upon availability of funds) to ensure in-country capacity-building for sustainability and maintenance of the programme.

Oxygen is a smart investment. If we invest now, it will help in the future and save lives. For example, pneumonia is the world's leading infectious disease killer of children; it claims the lives of more than 800 000 children under the age of 5 every year, more than 2000 a day. The Every Breath Counts Coalition (<https://stoppneumonia.org/every-breath-counts/>)

A survival analysis of 121 patients admitted to De-Martini hospital with COVID-19 showed that the survival probability of patients who had medical oxygen was 75% at day 7 and consistently remained at over 70% even at 14 days after admission compared with patients who received both oxygen and non-invasive ventilation (12% survival probability)

estimated that pneumonia killed more than 15 165 children under 5 in Somalia in 2018 – more than two children every hour – and 21% of child deaths were due to pneumonia. Pneumonia was also the biggest killer of children under 5 in 2017.

The current COVID-19 crisis is bringing an opportunity as well. If oxygen availability can be ensured and scaled up, it will not only save the lives of COVID-19 patients, but will also prevent deaths from pneumonia, because, with a little training, oxygen levels in children can be monitored by trained community health workers who can quickly refer them when needed to primary and secondary health facilities which have oxygen. It is critical now, more than ever, for Somalia's health sector to ensure availability of medical oxygen in all 18 regional hospitals by investing in the supply of oxygen as the country recovers from the COVID-19 crisis. WHO will also closely monitor the effect of this investment in oxygen on health outcomes, especially in those suffering from pneumonia and breathing difficulties.



© World Health Organization

Country Office in Mogadishu, Somalia

Correspondence: +252616695096;

Email: emacosomwr@who.int; emacosomexr@who.int

URL: <http://www.emro.who.int/countries/somalia/index.html>



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