Review Article

An Ethiopian effort to improve access to intensive care units during the start of the COVID-19 pandemic, a lesson to improve access beyond COVID-19

Menbeu Sultan[1], Woldesenbet Waganew [1], Sisay Yifru[2], Miraf Walelign[2], Berhane Redae[2], Aschalew Worku[3], Aklilu Azazh[3]

Abstract

Introduction: At the start of the COVID - 19 pandemic, the biggest concern was the health systems ability to cope with the surge of patients. Low bed capacity and insufficient equipment, were some of the main concerns regarding the treatment of critically ill COVID – 19 patients. This manuscript aimed to document the efforts made to improve critical care capacity for COVID - 19 care and to explore the lessons learnt in improving access beyond COVID - 19.

Methods: A systematic review was conducted of published and unpublished documents from the Ministry of Health, which included mentorship and coaching reports from the team deployed to individual ICUs. Furthermore, key informants from the Ministry of Health were interviewed.

Results: There were 53 ICUs which had less than 300 beds, this amounts to a below 0.3 bed capacity per 100,000 people. The effort created an additional 200 beds in the COVID – 19 ICU, provided just-in-time training and simulation sessions for non- ICU clinicians which solved the shortage of professionals and the mentorship and coaching done in all ICUs and the leadership provided, improved critical care quality. The availability of mechanical ventilators increased by more than double from the base line.

Conclusion: There was a significant improvement in level of ICU care delivered during the pandemic. It is recommended that the high level of motivation be maintained and there should be long-term investments put in place, which seek to improve service delivery beyond COVID -19 in Ethiopia. [*Ethiop. J. Health Dev*: 2021: 35(SI-4): 00-00]

Key words: Intensive care units, resources, COVID 19.

Introduction

Intensive care units (ICU) have significantly improved the quality of care and the outcomes of critically ill and injured patients, especially for those who require organ support and monitoring. However, this development and outcome is disproportionate between high-income and low-income settings (1) (2). ICUs are typically staffed with highly specialized health care professionals, systematic monitoring, and the use of high-cost technology. This is not the case in low-resource settings and has been the main contributing factor to the slow development of ICUs in low-resource settings (3). In sub-Saharan Africa, ICUs have varying qualities and quantities of infrastructure which are necessary for the provision of proper critical care services (4).

The concept of ICU in Ethiopia was started in 1956. Ethiopian intensive care delivery and its development have been besieged by multi-faceted challenges. There have been efforts to expand critical care services. However, with the increase in challenges brought on by infectious diseases and pandemics such as COVID – 19, hospitals are inundated with an increased number of patients requiring ICU admission. Since the first diagnosis of COVID - 19 in Ethiopia, the increasing demand of critical care services was anticipated. ICUs are simultaneously challenged on multiple levels. These challenges include resource limitations, infection control, protection of healthcare workers (HCWs), and the adaptation of services to a rapidly evolving pandemic. The very infantile stage of ICU services, such as limited bed capacity necessitated a significant effort, which include innovative ways of expansion in the face of increased demand from the government and stakeholders (5).

Most low and lower middle-income African countries have access to limited critical care capacity to deal with potential surges in critical care demands due to COVID - 19 outbreaks(6). At the start of the COVID - 19 pandemic the greatest concern was the health systems ability to cope with the surge of COVID – 19 patients. The major challenges regarding critical care delivery during the start of the COVID - 19 pandemic was increasing the ICU bed capacity, increasing the supply of equipment and consumables, human resource capacity building and ensuring availability of adequate personal protective equipment. This manuscript, aimed to describe the efforts made towards improving the first three priority areas, the challenges experienced and the lessons learned.

Materials & Method

A systematic review was conducted of published and unpublished documents obtained from the Ministry of Health, including mentorship and coaching reports produced by the team deployed at the individual ICUs. In addition, key informants from the Ministry of Health were interviewed. The data collected was reviewed among the panel of experts serving as the COVID - 19 clinical advisory team from the Federal Ministry of Health. Following the review of the documents and the interviews, the findings that were identified were

[1] St. Paul's Hospital millennium medical college, e-mail address smenbeu@yahoo.com
[2] Ministry of health Ethiopia clinical acre adviser
[3] Addis Ababa University College of health sciences.

thematically analyzed. In addition, a review of selected themes was carried out. Since the study was a qualitative study which included a review of documents, the ethical clearance was not necessary.

Results and discussion

Baseline status: At the start of the pandemic there were 53 ICUs with a bed capacity of less than 300. Of these, 51 ICUs were assessed for their status. Most of the ICUs were distributed in central parts of the country (figure 1 below). Most 77.3%, (41/51) of the ICUs were not equipped for critical care delivery, with none of them having an isolation room or a negative pressured room. Close to 60% (29/51) of the ICUs had less than 6 beds, it was nearly impossible to dedicate some of the beds for COVID - 19 care. The total number of mechanical ventilators available were 261. Majority (76.4%, 39/51) of the ICU beds did not have invasive monitoring and none of them had standardized routine invasive monitoring. Only a few of the (4/51) ICUs had access to dialysis services at their hospitals.

Nearly half 27/51 of the ICUs did not have ICU trained senior professionals and those who had the said professionals were located in Addis Ababa. However, none of them had neither a nutritionist nor a respiratory therapist. Although an ICU is expected to have a documented educational program for the growth of the junior staff, only 14% (7/51) of the ICUs were found to render daily education for the staff. Almost a third (15/51) of the ICUs had QI projects aimed at improving the quality of care and almost half of them had infection prevention standards. Interestingly, however, none of the ICUs had a specific plan to expand their capacity during or in response to disasters.

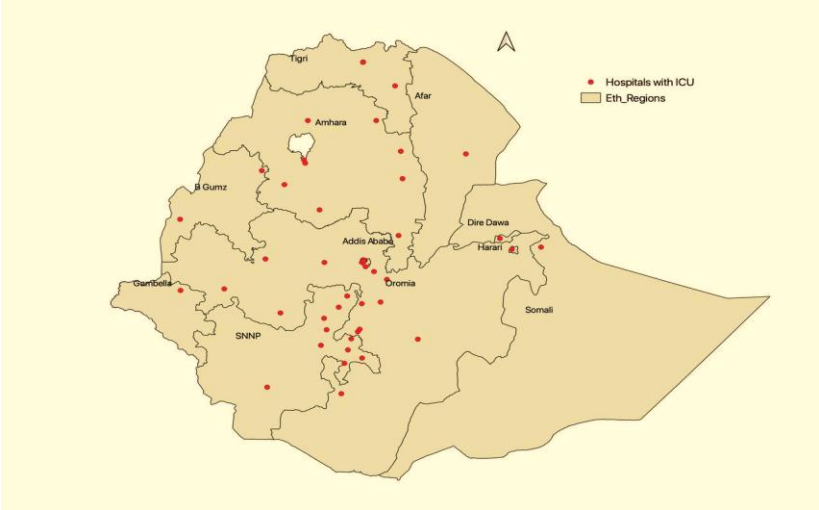

Figure 1: **distribution of intensive care units in Ethiopia 2021.**

Improvement efforts

To improve ICU capacity: At the start of the pandemic, the available ICUs were inadequate for service delivery even prior to the pandemic. The 300 bed capacity of the Ethiopian ICUs, was below the lowest income African countries, which was set at 0.5 beds per 100, 000 individuals(6). A significant effort was exerted to open new ICU centers and to and repurpose existing ICUs. This effort resulted in the establishment of the Millennium whole ICU and the field hospital ICU, and whilst the Eka Kotebe hospital was repurposed, the St. Paul's hospital millennium medical college ICU was expanded. Furthermore, new treatment centers were opened in all regions, with an inpatient bed capacity of more than 15,000 beds and with an additional 537 critical care beds.

Reports from low resource settings have indicated that there were insufficient hospital beds and ICU beds. The average number of ICU beds per 100,000 people ranged from 0.53 in low-income countries to 8.59 in upper-middle countries and 33.07 in the Seychelles (6). In order to cope with the increasing demands, the healthcare sector had to cancel elective surgeries and non-essential care, repurpose other hospital units, work to convert convention centers and dorms, virtual care and/or modular hospitals were some of the recommended methods of ensuring the required bed capacity was available. Pre-existing ICU triage and end-of-life care principles should be established, implemented and updated on a regular basis (7).

Human resource

Staff capacity building: To ensure quality care in critically ill patients, capacity building of healthcare workers at all levels of the healthcare system is paramount. Indeed, adequate and well-trained nurses and physicians have a pivotal role to achieve the goal of reducing morbidity and mortality of critically ill patients in ICU(8) . For this endeavor, the Health Ministry of Ethiopia in collaboration with other stakeholders such as tertiary university hospitals and societies cascaded diverse capacity building strategies through the mobilization of different experts. In order to ensure this, context appropriate training manuals were developed by the clinical advisory team which contained a guide with an introductory two-day training on COVID - 19 and infection prevention and control for low-level providers, as well as a six-day training for critical care providers. The latter training emphasized on triaging, resuscitating unstable patients, setting up an ICU and monitoring service delivery, and the utilization of ICU equipment including mechanical ventilators. The training was composed of class-room based teaching, skill based training, and mentoring support. With this program, more than 2500 nurses and junior doctors were trained

and deployed to the critical care units delivering COVID - 19 ICU care(9).

The number of ICU trained professionals is low in Africa, there is an average of 2.42 total (physician and non-physician) anesthesia providers per 100,000 people ranging from 1.24 and 0.66 in low-income countries. Therefore, providing just-in-time training and simulation sessions for non- ICU clinicians reassigned to work in ICU, may be beneficial in enabling them to better prepare for their roles (10) (11). Delivering innovative ways of teaching like telemedicine will ensure that patients benefit from emerging therapeutic options and high-quality of care. The psychological impact of critical care during pandemics on healthcare workers is huge(12). Given this is an identified risk, employers, and society in general, have a duty to provide support to healthcare workers during the COVID -19 pandemic in an effort to mitigate, the potential harmful impacts.

Mentorship and coaching: Due to the concept of critical care being in an infantile stage, especially outside of the capital cities, it required continuous support for the established ICUs. In addition, as most of the critical care trained doctors and nurses were concentrated in Addis Ababa, a mentorship and coaching program was designed for all of the ICU staff and leadership.

The program was conducted once or twice per center following the establishment of a clear objective with the visiting team. The team consisted of one critical care trained doctor including an intensivist, an emergency and critical care doctor, pulmonology and critical care doctor or Anesthesiologist, one critical care trained nurse (trained and practiced in ICU) and one person for leadership purposes.

A presentation of the current status of the Ethiopian ICU was made and a framework for mentorship and objectives was developed for the team prior to their placements. The objectives included supporting the ICU in order to improve quality critical care, building the capacity of mid-level providers to manage unfamiliar or complicated cases in ICU, advocating for the ICU to have a better system, leadership and support, assist ICUs to have a quality improvement project, assist ICUs to have a continuous educational session for staff, assist ICUs to have a better workflow process, assist ICUs to have a good infection prevention practice, assist ICUs to have a better utilization of ICU equipment and to inform the leadership for priority areas of action.

All centers were assessed for the impact of the mentorship program and it was found that it enabled the staff to identify their gaps and to improve it through time. It also enabled the staff to improve their non-COVID - 19 ICU service delivery and enabled to learn from the system thereby improving service delivery. Research has indicated that mentoring interventions were effective in improving the clinical management of infectious diseases, maternal, neonatal and childhood illnesses. The mentorship programs along with linkage of nearby ICU through spoke and hub models and telemedicine is a beneficial tool that enables skilled critical care physicians and nurses to work in areas from which they are geographically remote and enables high-risk healthcare workers to work remotely(13) (14) (15).

Supplies (equipment and consumables)

Critical care delivery requires expensive equipment and consumables. In low-income and middle-income countries (LMICs), the pandemic has drawn attention to the scarcity of much-needed resources for critical care(16). Mechanical ventilators, monitors, airway equipment, defibrillators, an adequate supply of oxygen with distributions like cylinders, and medications are some of the essential supplies required. The number of mechanical ventilators in Ethiopia has increased from 265 to 612 and more than 180 monitors were distributed during the early stages of the pandemic.

Oxygen therapy is a low-cost and life-saving therapy for patients with COVID - 19. An adequate provision of medical oxygen is an essential factor, which contributes to the survival of the majority of patients with COVID - 19 in Africa(17) (18). The World Health Organization (WHO) estimates that the average flow-rate of oxygen to severe COVID -19 patients is 10 l/min. However, Sub-Saharan African countries lack an affordable and reliable oxygen supply (17). Research in African countries demonstrate how oxygen provision can be scaled up through innovative and cheap technologies. The oxygen production in Ethiopia has increased threefold. A large number of oxygen cylinders and oxygen concentrators were distributed.

Challenges and the way forward

The main challenge was to boost the capacity from the infantile status in the context of resource shortage. Materials that required capital investment like increasing the capacity of pressurized medical gas lines and power supplies were limiting factors. Experienced human resources and the transportation of patients to the centers were also some of the challenges faced. Inadequate distribution of critical care beds at some of the regions, resulted in decreased bed capacity. Under developed bio-medical engineering and respiratory therapy led to underutilization of the ventilators. The introduction of ICUs at remote areas (primary centers), did not prove to be beneficial as the demand for service delivery remained at the center. Post COVID – 19, healthcare workers can be proud of their critical care settings, as they are at an admirable level (19) (20) (21).

Conclusion

This research has demonstrated that the critical care capacity in Ethiopia was at its infancy at the start of the COVID – 19 pandemics. The efforts aimed at improving access to ICU services, has enabled an increase in bed capacity and an increase in short term trained professionals by more than 6 times as compared to the base line. Mechanical ventilators increased by more than double and oxygen delivery also increased with the distribution mechanism. It is obvious to

healthcare workers and policymakers alike that an effective critical care surge response must be nested within the overall care delivery model. High motivation must be maintained and expanded beyond COVID – 19, with regards to the full range of issues that need to be addressed in critical care medicine in Ethiopia.

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