Commentary: Reducing Covid-19-Related Deaths in Nigeria: More than Ventilators

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I. INTRODUCTION

In December 2019, a strain of Coronavirus later called Coronavirus disease 2019 (COVID-19), broke out in Wuhan, China [1–3]. COVID-19 mainly affected the respiratory system with some patients rapidly progressing to acute respiratory distress syndrome (ARDS). Some of the patients affected get admitted to the intensive care unit (ICU) and many deaths have been reported. The elderly and those with comorbidities are at highest risk of death. The death appeared to be related to ARDS [4].

In Nigeria, the first case of COVID-19 was reported on February 27 in an Italian expatriate. Since then, the number of cases has progressively increased. Presently, the case fatality in Nigeria is around 3%. Except for the lower case fatality rate of South Africa, 2% the Nigerian figure is much lower than the 6.3%, 5.9%, and 14.3% reported as the global case fatality rate and that of United States of America and United Kingdom respectively [5]. An underestimation of figures from Nigeria is not unlikely because of poor population data base and inadequate coordination between the states and the central government.

II. CLINICAL PRESENTATION

In the report by Wu and McGoogan, among 72,314 COVID-19 cases reported to the Chinese Center for disease Control and Prevention (CCDC), 81% were mild (absent or mild pneumonia), 14% were severe (hypoxia, dyspnea, >50% lung involvement within 24-48 hours), 5% were critical (shock, respiratory failure, multiorgan dysfunction), and 2.3% were fatal[6]. Also, the International Severe Acute Respiratory and Emerging Infections Consortium (ISARIC) report on COVID-19 [7] published on 6th May 2020 opined that of the 20,276 with a positive history of COVID-19 in their database, 3767(19%) required care in the high dependency unit(HDU) or intensive care unit (ICU).The details of treatment revealed that of the totalpatients,10,281(51%) had oxygen only via nasal or face masks. Non-invasive ventilation, invasive mechanical ventilation and extra-corporal membrane oxygenation (ECMO) were provided for 3039(15%), 2286(11%) and 226(1%) respectively. A treatment outcomes study of the first thirty-two COVID-19 patients managed in Nigeria revealed that most patients had mild to moderate symptoms and none had low oxygen saturation that requiring support in the HDU or ICU[8]. However, a major limitation of this study was the failure to provide details about respiratory support offered the patients.

III. THE ICU AND COVID-19

Despite the low percentage of COVID-19 patients that may require care in the HDU/ICU, it is important this aspect of patient care is optimized as much as possible as this will definitely help to reduce mortality in those with severe illness. Once the initial care with basic oxygen therapy and proning fails, guided by pulse oximetry and arterial blood gas results, most patients ends up in the intensive care unit. Pre-COVID-19 era and even now, ICU beds and facilities in Nigeria are largely inadequate[9]and the advent of COVID-19 has brought this clearly to the fore. Notable among identified challenges is the failure of government to recognize the key role of the ICU in the delivery of efficient health care, this is probably responsible for the poor funding. Other issues like inadequate personnel and high cost of care because ofout of pocket payment remains yet additional challenges.

The additional requirements expected in a COVID-19 compliant ICU presents a double jeopardy for ICU primary care providers and government in Nigeria. The possibility of having more than normal ICU admissions in a setting of few trained staff and the need for infection control tools and facilities (negative pressure rooms, highly efficient particulate air filters, single use items etc.) which hitherto were unavailable are evident challenges.

IV. BAND-WAGON EFFECT

There was a band-wagon effect that led to unguided acquisition of mechanical ventilatorsin Nigeria at the onset of the COVID-19 pandemic. Apart from fact that many of the ventilators were bought without guidance by the end-users, many other facilities that will allow for effective use of these ventilators were neglected, this includes but not limited to pulse oximeter, arterial blood gas machine, mobile X-ray, mobile ultrasound scan. Osinaike et al in the Nigerian Surgical Outcomes Study (NiSOS) [9] reported a wide gap between ventilators and arterial blood gas machines in Nigeria, this gap is likely to have widened further. A major error observed with the purchase of ventilators in some instances is the complete lack of personnel (Anaesthetist/Intensivist) responsible for managing patients on the ventilator.

V. WAY FORWARD

Despite apparent limitations with ICU care, Nigeria may be able to reduce mortality in COVID-19 patients with severe to critical illness if we follow locally applicable well-defined protocols and not just copy what is done in the developed nations. Despite the very important role of ventilatory therapy in the ICU, delivering critical care will be practically impossible without many other basic facilities and trained personnel. Specifically, with regards to care of the COVID-19 patients in the ICU, the following should receive major attention.

Oxygen access is a commonly neglected element of essential health care, despite its essential role in the treatment of numerous conditions. COVID-19 should create an opportunity for substantial investment in this essential therapy. Robust responses should include a balance of both short- and long-term oxygen supply solutions, like the use refillable oxygen cylinders, oxygen concentrators, and on-site oxygen plant [10].Oxygen therapy is recommended for all severe and critical COVID-19 patients, with the use of nasal cannula, venturi mask, and mask with reservoir bag [11]. Other devices like the high-flow nasal cannula (HFNC), invasive and non-invasive ventilation (NIV) are dependent on a sustained piped oxygen delivery system.

As important as oxygen is, delivery devices play important role as link to the patients. It is unfortunate that in certain situations, non-availability of these devices had led to unnecessary complications and deaths. In adults with COVID-19 and acute hypoxemic respiratory failure, conventional oxygen therapy may be insufficient to meet the oxygen needs of the patient. The use of HFNC and NIV has been shown to be associated with reductions in the need for therapeutic escalation and intubation [12]. The high-flow nasal cannula also referred to as "COVID-19 Ventilator" and non-invasive ventilation (Continuous or Bi-Level Positive Airway Pressure) devices are important equipment with lower costs that can be available for use by larger number of patients and also require less expertise compared to when ventilators are used. However, HFNC and NIV devicescarry a risk of aerosol generation and thus requiring airborne precautions by the health workers using them.

Furthermore, oxygen therapy is used in conjunction with pulse oximeters, patient monitors(with facilities for invasive blood pressure), suction devices, and other tools essential for intubation. The pulse oximeter occupies an important place for monitoring oxygenation in COVID-19 patients. Apart from being a necessary tool for monitoring oxygenation during care, it places a huge role during triage. The term "silent" or "happy" hypoxia has been used to describe a phenomenon in COVID-19 symptomatology: the patient is very hypoxaemic- they may have an oxygen saturation well below 90% on room air, but clinically they look very comfortable and they are not dyspnoeic or tachypnoeic. The pulse oximeter therefore helps with early diagnosis of deterioration in the initial period.

The assessment of oxygenation and metabolic abnormalities is better done with a device that measures the arterial gas levels. The arterial blood gas machine remains a valuable tool in the COVID-19 ICU, especially since the ratio of the partial pressure of oxygen (PaO_2) to the fraction of inspired oxygen(FiO_2) may help to determine the path of care. In a Chinese treatment protocol for COVID-19, COVID-19-related acute respiratory distress syndrome (ARDS) was divided into three categories based on oxygenation index (PaO_2/FiO_2) on PEEP $\geq$ 5 cm H_2O: mild (200 mmHg $\leq$ PaO_2/FiO_2 < 300mmHg), mild-moderate (150mmHg $\leq$ PaO2/FiO_2 < 200mmHg), and moderate-severe (PaO_2/FiO_2 < 150 mmHg)[13]. The new stratification for COVID-19-related ARDS determines personalized treatment for different patients. A number of ARDS treatments, including prone positioning and ventilation with added neuromuscular blockers, are recommended for patients with PaO2/FiO2 less than 150mmHg [13].The gap between the volume of mechanical ventilators and ABG machines in Nigeria should be reduced by ensuring all centres with ventilators have ABG machine/s to guide ventilatory therapy.

Ventilatory therapy is the hallmark of care in the ICU. COVID-19 patients that needs ventilation often require personalised ventilatory care which can only be delivered byrobust ICU ventilators. This is premised on the recent postulation of two phenotypes (L and H phenotypes) of COVID-19 patients during ventilatory management [14].In addition, in view of the peculiarities of our low resource environment (e.g. inadequate electricity supply), procurement of ventilators should be guided by appropriate guidance of clinical stakeholders. It is necessary to ensure that centres offering ventilatory therapy have other complimentary facilities like portable X-ray, ultrasound scan, and fluid delivery devices.

Finally, sophisticated equipment and tools in the ICU only make meaning in the setting of highly trained and well-motivated personnel. It therefore important for efforts to be directed at re-training of existing ICU workforce in the short term and long-term measures put in place to improve the capacity of the medical and nursing workforce.

VI. CONCLUSIONS

Even in COVID-19 patients with severe to critical symptoms, a bottom to top approach in the organisation of the ICU will allow for provision of efficient cost-effective care to a large number. This will definitely lead to a reduction of deaths in this patient cohort. However, huge commitment is required from the primary care provider and government to achieve this. *Reducing COVID-19-related deaths in Nigeria is definitely more than ventilators.*

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