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► **To cite this version:**

S Tchamgoué, M Ntep Eboko, A Makamté, A Ngagnia, F Talla-Mba, et al.. Prospective cohort of COVID-19 patients requiring hospital admission in Douala, Cameroon. *Infectious Diseases Now*, 2023, 53 (5), pp.104713. 10.1016/j.idnow.2023.104713 . hal-04089207

**HAL Id: hal-04089207**

**<https://hal.science/hal-04089207>**

Submitted on 16 May 2023

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Short communication

Prospective cohort of COVID-19 patients requiring hospital admission in Douala, Cameroon

S. Tchamgoué, M. Ntep Eboko, A. Makamté, A. Ngagnia, F. Talla-Mba, O. Nitcheu Wendi, E. Kafando, B. Tengang, J.P. Sandjon, P. Tattevin

S Tchamgoué 1 , M Ntep Eboko 1 , A Makamté 2 , A Ngagnia 3 , F Talla-Mba 1 , O Nitcheu Wendi 1 , E Kafando 4 , B Tengang 5 , J P Sandjon 6 , P Tattevin 7

Affiliations

Affiliations

- 1 Polyclinique Bordeaux Douala, Douala, Cameroon.
- 2 Polyclinique Bordeaux Douala, Douala, Cameroon; Interactive Medical Imaging Complex (IMIC), Douala, Cameroon.
- 3 Polyclinique Bordeaux Douala, Douala, Cameroon; Interactive Medical Imaging Complex (IMIC), Douala, Cameroon; Centre des Maladies Respiratoires, Douala, Cameroon.
- 4 Interactive Medical Imaging Complex (IMIC), Douala, Cameroon.
- 5 Centre des Maladies Respiratoires, Douala, Cameroon.
- 6 Centre Médical d'Urgences, Douala, Cameroon.
- 7 Services des Maladies Infectieuses et Réanimation Médicale, Hôpital Pontchaillou, Centre Hospitalo-Universitaire, Rennes, France. Electronic address: pierre.tattevin@chu-rennes.fr.

**ABSTRACT**

**Objectives.** To report characteristics and outcome of COVID-19 patients who required hospital admission in sub-Saharan Africa clinics with no access to invasive mechanical ventilation.

**Methods.** Between April and June 2021, documented COVID-19 patients with  $\text{SaO}_2 < 95\%$  who were admitted in two clinics in Douala (Cameroon) were invited to participate. Data were prospectively collected using a standardized questionnaire.

**Results.** We included 67 patients: 39 males (58%), median age 62 years [50-70]. Comorbidities included hypertension (n=38, 57%), obesity (n=26, 38%), and diabetes (n=16, 24%). No patient reported COVID-19 vaccination. On admission, 35 patients (52%) required  $\text{O}_2 > 6$  L/min. CT scan demonstrated extended lesions (>50%) in 50/61 cases (82%). Most patients received dexamethasone (n=64, 96%), heparin (n=64, 96%), chloroquine/azithromycin (n=59, 88%), and broad-spectrum antibiotics (n=59, 88%). Sixteen patients died (24%), after a median of 11.5 days [7.5-15.5] post-admission.

**Conclusions.** Despite the lack of invasive mechanical ventilation, 76% of COVID-19 patients survived.

**Keywords.** COVID-19; intensive care unit; Cameroon; mechanical ventilation; prognosis

## 1. Introduction

The COVID-19 pandemic has been a public health disaster in America, Europe, and Asia, with an estimated death toll of respectively 2.9, 2.2, and 1.5 million [1]. Paradoxically, Africa seemed to be much less impacted, with an estimated 258,000 COVID-19-related deaths on the continent as of March 2023, although several seroprevalence studies suggested that people living in Africa were infected as much as people living on other continents [2]. These findings were unexpected given the scarcity of health care structures available in sub-Saharan Africa to manage patients with respiratory failure, the primary cause of death related to COVID-19. Access to invasive mechanical ventilation, a life-saving intervention in patients with respiratory distress syndrome, is particularly limited in most sub-Saharan African countries [3]. In addition, several risk factors for lethality during COVID-19 are common in Africa, including diabetes, obesity, malnutrition, and HIV infection [4, 5].

Many hypotheses have been proposed to explain the seemingly disproportionately low burden of COVID-19 in sub-Saharan Africa, including large underestimates of COVID-19-related deaths [2], high prevalence of genetic resistance in local population, or a dramatic impact of the age pyramid with a broad base, as is the case in most African countries. However, the relative impact of these putative factors is unknown [6], while data on the management of severe COVID-19 in sub-Saharan Africa remain scarce [7]. We aimed to report the experience of two clinical sites with no access to invasive mechanical ventilation in Douala, Cameroon, on the management of severe COVID-19.

## 2. Methods

The *Centre Médical d'Urgence* (CMU) and the *Centre des Maladies Respiratoires* (CMR) are two private clinics that provide outpatient and inpatient care in the downtown of Doula, the largest city of Cameroon (estimated population during the study period, 3.5 million inhabitants). In 2020, the Cameroonian ministry of health set up four COVID-19 referral care centers in the littoral region (Douala and surroundings, population catchment area estimated at 4 million inhabitants): two government-owned public hospitals, and these two private clinics (CMU and CMR). When COVID-19 patients required hospital admission in the area, they could be admitted in one of these four facilities. Patients admitted in a private health center were either supported by their health insurance or had to pay the cost of their admission.

Each of these two clinics opened a 20-bed inpatient wards dedicated to severe COVID-19 management, including a specific section with continuous monitoring and access to high-flow nasal oxygen (HFO), up to 30 L/min: four beds at the CMU, and eight beds at the CMR. These COVID-19 wards were managed 24/7 by at least one senior physician, one junior physician and two nurses in each clinic, who had received specific training on the management of COVID-19. All patients were admitted to single rooms, with strict implementation of infection control measures to protect health care workers and other patients. In case of failure, non-invasive respiratory support, including continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BPAP), was implemented. Additional support included broad-spectrum antibiotics, corticosteroids, fluid resuscitation, and vasopressors whenever required throughout the study period, while there was no access to invasive mechanical ventilation in both facilities. All patients requiring oxygen were treated with corticosteroids. The decision to prescribe antibiotics

was left at the discretion of the physician in charge, based on clinical, biological, and radiological findings.

During the second wave of COVID-19 in Cameroon (April-June 2021), patients with COVID-19 who were admitted in these two clinics were invited to participate in an observational study. Inclusion criteria were: *i)* adult patients (at least 18 years old); *ii)* documented COVID-19 (PCR or antigen test on nasopharyngeal sample); *iii)* need for oxygen support on hospital admission. Data were prospectively collected on a standardized questionnaire, including demographics, comorbidities, symptoms, imaging studies, treatment received, and outcome at day 7, day 28, and day 90. All patients who fulfilled inclusion criteria were informed about the study by the physician in charge, including the objectives and data collected, and they were made aware that participating in the study would have no consequence on their management. Only patients consenting to participate (written consent) were enrolled in the study. The study was approved by the regional institutional review board.

Quantitative data are presented as medians [interquartile range] and qualitative data as numbers (%). We performed a univariate analysis of variables associated with day 28-mortality. A  $p$ -value  $<0.5$  was considered statistically significant.

### **3. Results**

We included 67 patients: 39 males (58%), median age 62 years [50-70]. Comorbidities included hypertension (n=38, 57%), obesity (defined as a body mass index [BMI]  $>30$  kg/m<sup>2</sup>) (n=26, 38%), diabetes (n=16, 24%), alcohol abuse (n=6), chronic obstructive pulmonary disease (n=2), HIV infection (n=2), liver cirrhosis (n=1), and end-stage renal disease (n=1). No patient reported COVID-19 vaccination.

On admission, the Quick SOFA score was 2 in eight patients (12%), 1 in 44 (66%), and 0 in 15 (22%). Median oxygen saturation when patients were breathing room air was 89% [85%-93%], and 49/67 patients (73%) had a respiratory rate  $\geq 22$ /min. All patients received oxygen, at a median flow of 6.5 L/min [4-10]. The objectives were to maintain oxygen saturation  $\geq 95\%$ , using a nasal cannula for oxygen flow up to 6 L/min, face mask from 7 to 14 L/min, and BPAP when patients required oxygen flow  $\geq 15$  L/min. CT scan results showed extended lesions ( $>50\%$ ) in 50/61 cases (82%).

All patients were treated with oxygen support, fluid resuscitation, and corticosteroids: dexamethasone (n=64), or methylprednisolone (n=3) when dexamethasone was not readily available. Most patients also received heparin (n=64, 96%), chloroquine/azithromycin (n=59, 88%), and broad-spectrum antibiotics (n=59, 88%). Eleven patients required HFO through BPAP (16%). Two patients received vasopressors (norepinephrine). Sixteen patients died (24%), after a median of 11.5 days [7.5-15.5] post-admission. Patients' characteristics are detailed in Table 1. At day 28, 16 patients (24%) had died. We found no variable associated with day 28-mortality. One additional patient died at day 90 (sudden death at home, unknown etiology).

#### **4. Discussion**

In this bicentric prospective study of patients requiring hospital admission for acute respiratory distress during COVID-19 in Douala, Cameroon, we found that 51/67 patients (76%) survived, although invasive mechanical ventilation was not available. Treatment included oxygen support, fluid resuscitation, dexamethasone, and heparin for  $>95\%$  of patients. A large proportion of patients also received the combination of hydroxychloroquine and azithromycin, in line with national guidelines during the study

period, despite robust evidence that these treatments have no effect on COVID-19. As 52% of patients required  $O_2 >6$  L/min on admission and as CT scan results showed extended lesions (>50%) in 82% of them, the 76% survival rate suggests that the management of patients in these units was beneficial. We had no access to SARS-CoV-2 typing for these patients, but we may hypothesize that most of them were infected by the alpha or the delta variant, which predominated in sub-Saharan Africa and worldwide during the study period.

Few studies described the characteristics, management, and outcome of COVID-19 patients who required hospital admission in sub-Saharan Africa [8]. A recent meta-analysis of studies published up to September 2021 identified eight studies only including hospitalized patients, with mortality rates ranging from 4% to 25% [9]. Age, male sex, hypertension, chronic kidney diseases, and critical infection on admission were all associated with increased mortality. Since that meta-analysis, two large studies of COVID-19 patients admitted in Cameroon reported mortality rates similar to ours: at the Bafoussam Regional Hospital (West Cameroon), the in-hospital mortality rate was 30% (120/400) in a population younger than ours (mean age, 55.8 years), but with a higher prevalence of diabetes (58%) [10]; at Laquintinie hospital (Douala, Cameroon), the in-hospital mortality rate was 22% (129/580) during the first wave [11]. A single-center study conducted in Ethiopia reported a lower in-hospital mortality rate, at 11% (47/422), during the years 2020-2021 [12]. In Northern Uganda, Baguma *et al.* reported a much lower in-hospital mortality rate, at 5% (32/664), during the years 2020-2021, but the authors focused on patients who died and provided no detail on the overall cohort [13]. These studies on COVID-19 patients admitted in sub-Saharan Africa hospitals cannot be reliably compared due to potential heterogeneities in hospital admission criteria and in the level



of care provided in these hospitals (e.g., equipment available, human resources), often not detailed in the studies.

A large study on COVID-19 patients admitted to African intensive care units (ICU) has been recently published by the African COVID-19 Critical Care Outcomes Study (ACCCOS) consortium [7]. The authors included 3,140 patients with critical COVID-19 admitted in 2020. Patients' demographics were similar to our study (mean age 55.6 years, 60% of males), with a slightly higher prevalence of comorbidities, primarily hypertension (51%), obesity (41%), and diabetes (38%). The 30 day-mortality was 48%, much higher than in our study, as could be expected given that *i*) hospitals participating in the ACCCOS consortium have the ability to provide invasive mechanical ventilation; they thus enrolled patients with higher severity on admission, as illustrated by a Quick SOFA score of 0, 1, 2, and 3 in respectively 13%, 58%, 21%, and 8% in the ACCCOS study, as compared with 22%, 66%, 12%, and 0% in our study; *ii*) the ACCCOS study was conducted during the first year of the COVID-19 pandemic, in 2020, while basic measures for the management of critical COVID-19 gradually improved. For example, only 84% of patients with respiratory distress received corticosteroids in the ACCCOS study, as compared to 100% in our study. However, a large study of COVID-19 patients admitted in the ICU in South Africa found similar in-ICU mortality during the first wave (252/408, 62%) and the second wave (54/82, 66%) [14].

Our study has limitations. We only included patients from two clinics in one city, with limited sample size. In addition, these clinics had no access to invasive mechanical ventilation. Finally, the study only lasted three months and most cases were related to the alpha or the delta variant. Hence our findings may not apply to other settings or other variants, as the severity of disease changed dramatically with the worldwide emergence of the Omicron variant by the end of 2021 [15, 16]. However, this study provides original

data on the characteristics and outcomes of severe COVID-19 cases managed in clinics with no access to invasive mechanical ventilation, which may be of interest for colleagues working in similar settings.

### Conclusion

We found that severe COVID-19 patients admitted in two Sub-Saharan African clinics with no access to invasive mechanical ventilation had a 28-day mortality of 24%.

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**Table 1.** Patients' characteristics

Variable	Survived (n=51)	Died (n=16)	Overall (n=67)
Age, years	64 [50-72]	64 [54-75]	64 [48-70]
Male	31 (61%)	8 (50%)	39 (58%)
Obesity*	17 (33%)	9 (56%)	26 (39%)

Diabetes	10 (20%)	6 (37%)	16 (24%)
Hypertension	26 (51%)	12 (75%)	38 (57%)
O <sub>2</sub> >6 L/min on admission	22 (43%)	13 (81%)	35 (52%)
Extensive lesions on CT scan <sup>§</sup>	36 (72%)	14 (87%)	50/61 (82%)

\* Body mass index > 30 kg/m<sup>2</sup>

<sup>§</sup> >50% of lung

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S Tchamgoué<sup>1</sup>, M Ntep Eboko<sup>1</sup>, A Makamté<sup>1-2</sup>, A Ngagnia<sup>1-3</sup>, F Talla-Mba<sup>1</sup>, O Nitcheu Wendi<sup>1</sup>,  
E Kafando<sup>2</sup>, B Tengang<sup>3</sup>, JP Sandjon<sup>4</sup>, P Tattevin<sup>5</sup>

1: Polyclinique Bordeaux Douala, Douala, Cameroon

2: Interactive Medical Imaging Complex (IMIC), Douala, Cameroon

3: Centre des Maladies Respiratoires, Douala, Cameroon

4 : Centre Médical d'Urgences, Douala, Cameroon

5 : Services des Maladies Infectieuses et Réanimation Médicale, Hôpital Pontchaillou, Centre Hospitalo-Universitaire, Rennes, France

#### Ethics approval

This study was approved by the Douala region institutional review board.

#### Consent to participate and consent to publish

Patients were informed as part of requirements for institutional research.

**Corresponding author:** Pierre Tattevin, MD, PhD

Infectious Diseases and Intensive Care Unit

Pontchaillou University Hospital, 2, rue Henri Le Guilloux, 35033 Rennes Cedex 9, France.

Phone: +33 299289564

ORCID: 0000-0003-3617-5411

E-mail: [pierre.tattevin@chu-rennes.fr](mailto:pierre.tattevin@chu-rennes.fr)

### **Authors' contributions**

ST and PT participated in study design and wrote the original draft. ST, MNE, AM, AN, FTM, ONW, EK, BT, and JPS contributed to the investigation and data collection. All authors revised and approved the definitive version of the manuscript.

### **Highlights**

- Data on COVID-19 patients hospitalized in low-income countries are scarce.
- In clinics with no access to mechanical ventilation, the 28-day mortality was 24%.
- Most patients (>95%) received oxygen support, steroids, and anticoagulants.

### **Ethics approval**

This study was approved by the Douala region institutional review board

### **Consent to participate**

Patients were informed as part of requirements for institutional research.

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