


Epidemiological and Therapeutic Aspects of SARS-CoV-2 Disease in the Resuscitation Department of the Omar BONGO ONDIMBA Army Training Hospital

Raphaël Okoue Ondo^{1*}, Ghislain Edjo Nkilly¹, Arthur Ifoudji Makao², Sarah Dondyas Orema¹, Vanessa Sagbo Ada³, Wilfried Mouiry Bivigou⁴, Ulysse Mayegue Anani⁴, Jean-Marcel Mandji Lawson⁴

¹Anesthesia, Intensive Care and Emergency Department of the Omar BONGO ONDIMBA Army Training Hospital, Libreville, Gabon

²Anesthesia, Intensive Care and Emergency Department of the Libreville Hospital Center, Libreville, Gabon

³Anesthesia, Intensive Care and Emergency Department of the Owendo University Hospital Center, Libreville, Gabon

⁴Anesthesia, Intensive Care and Emergency Department of the Akanda Army Training Hospital, Libreville, Gabon

Email: *raphaelokoue@gmail.com

How to cite this paper: Okoue Ondo, R., Nkilly, G.E., Makao, A.I., Orema, S.D., Ada, V.S., Bivigou, W.M., Anani, U.M. and Lawson, J.-M.M. (2025) Epidemiological and Therapeutic Aspects of SARS-CoV-2 Disease in the Resuscitation Department of the Omar BONGO ONDIMBA Army Training Hospital. *Open Journal of Emergency Medicine*, 13, 126-141.

<https://doi.org/10.4236/ojem.2025.132013>

Received: April 1, 2025

Accepted: June 3, 2025

Published: June 6, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: The SARS-CoV-2 pandemic is a major public health problem worldwide. The most severe cases require hospitalization in intensive care units. The main objective of this study was to describe the epidemiological and therapeutic data of patients hospitalized in the Anesthesia-Resuscitation Department of the Omar BONGO ONDIMBA Army Training Hospital. **Patients and Method:** Descriptive, retrospective, monocentric study of patients admitted to the Department of Anaesthesia-Resuscitation for SARS-CoV-2 infection, in the period from December 2020 to December 2022. **Results:** 107 patients were enrolled, with a predominance of males (sex ratio 1.1). The mean age was 57.45 ± 15.93 years. The most frequent comorbidities were hypertension (52.3%) and diabetes (29.0%). The most frequent clinical signs were fatigue 81.3%, cough 42.10%, and fever 15.89%. Respiratory distress was predominant in 93.86% of cases. On admission, 79.47% of patients showed polypnea and 89.72% desaturation. ARDS was confirmed in 78.57% of patients with gasometry. RT-PCR was positive in 75.76% of cases. Chest CT scans were performed in 85.98% of cases, with ground-glass lesions in 70.65%. Management was based on Gabonese national recommendations. All patients received dual antibiotic therapy, 93.58% corticosteroids and 85.05% curative-dose heparin therapy. Vasopressor amines were required in 3.74% of patients, and 5.61%

benefited from extra-renal purification. The average length of stay was 5.93 ± 4.95 days, with extremes of 1 and 32 days. The outcome was unfavorable in 43.93% of patients. Conclusion: Knowledge of the profiles of SARS-CoV-2 infection will help improve patient management. A multisite study will provide a clearer picture and confirm the risk factors associated with disease severity.

Keywords

SARS-CoV-2, Epidemiology, Resuscitation, Gabon

1. Introduction

Coronaviruses are a large family of viruses that can cause a variety of illnesses in humans, ranging from the common cold to Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [1]. The novel human coronavirus disease COVID-19 has become the fifth documented pandemic since the 1918 influenza pandemic [2]. This new virus is the causative agent of this new respiratory infectious disease called COVID-19 (Coronavirus Disease 2019) [3]. This new virus is associated with a mortality rate of 0.1 to 1%, likely an overestimate given uncertainties regarding the denominator. Among identified patients, 15% of cases will develop a severe form, and mortality in intensive care units affects 30 to 70% of cases [4]. In Gabon, the first case was identified on March 12, 2020 [5], and the number of cases increased rapidly and in waves, with a first peak in June 2020, then a second in April 2021, and finally a third peak in January 2022. The clinical spectrum of the disease is broad, ranging from minimally symptomatic forms to extremely severe forms with life-threatening respiratory distress syndrome, requiring intensive care. The literature has increasingly confirmed these various points on the prognostic factors of patients with SARS-CoV-2, however in Gabon and the sub-region, these were mainly general patients [6] [7]. Studies specifically focusing on intensive care patients are rare.

The intensive care unit of the Omar BONGO ONDIMBA Army Training Hospital (OBO ATH) admitted its first patient on December 4, 2020. Since then, during this pandemic, it has admitted a growing number of patients with diverse profiles and sometimes discordant developments, in a pathology where the severity factors were quickly individualized, particularly advanced age [7] [8]. In fact, in a relatively young Gabonese population, it seemed useful to us to focus particularly on severe COVID patients, in their profile and evolution. We therefore carried out a study whose objective was to describe the epidemiological characteristics of the patients, and the therapies deemed necessary, in the intensive care unit of the Omar BONGO ONDIMBA Army Training Hospital.

2. Patients and Method

The study took place at the Anesthesia-Resuscitation and Burns Department of the Omar BONGO ONDIMBA Military Training Hospital. This was a descriptive,

retrospective, single-center study of patients with SARS-CoV-2 pneumonia. Our study took place over a two-year period, from December 2020 to December 2022. The study population consisted of any patient admitted to the intensive care unit for respiratory distress during the study period.

Our study included all patients admitted to the Anesthesia and Intensive Care Unit of the OBO Hospital during the study period for SARS-CoV-2 infection. The diagnosis was made based on the following clinical and paraclinical findings:

Clinically:

- Acute respiratory distress (less than 6 days), with or without signs of respiratory struggle (polypnea, involvement of accessory respiratory muscles).
- Clinical signs suggestive of SARS-CoV-2 infection (headaches, myalgia, polyarthralgia, ageusia, anosmia).

On the paraclinical level:

- Suggestive chest CT scan and/or;
- Positive PCR-TR and/or;
- Positive rapid diagnostic test and/or;
- Positive SARS-CoV-2 serology.

The following were not included:

- - Patients admitted for respiratory distress whose diagnosis retained different from SARS-CoV-2 pneumonia of an etiology other than SARS-CoV-2;
- - Patients under 15 years of age;
- - Patients with unusable records due to too much missing data, like report of missing chest scans, elements necessary for calculating the Liao score, length of stay and precision on the evolution (death, survival).

Data collection was conducted by reviewing patient records on a survey form including:

- Sociodemographic data: age, sex, race, anthropometric parameters, provincial origin and residential neighborhood, habits and lifestyle, and date of admission;
- Medical and surgical history;
- Previous functional status assessed by the Knaus score: we considered any patient on chronic treatment for at least 6 months, including patients with hemoglobinopathy;
- Clinical examination upon admission: this looked for the presence or absence of prodromes in the 7 days preceding admission. Resuscitation, hyperthermia (one patient was considered febrile with a temperature $>37.5^{\circ}\text{C}$), vital signs, and functional signs;
- Blood gas data and their completion time;
- Biological data upon admission, including Blood Count Formula, C-reactive protein, liver function tests, renal function tests, blood electrolytes, and D-dimers, expressed in the international nomenclature. RT-PCR, COVID-19 serology, and/or SARS-CoV-2 Rapid Diagnostic Test (RDT) results were also recorded whenever available;
- Computed tomographic data, including the time taken to perform the chest CT scan, the use or not of contrast media, the appearance of the lesions and

their invasion, allowing for COVID-19 Reporting and Data System (CO-RAD) classification;

- Research into the LIAO score parameters to clinically establish the severity profile of patients;
- Non-pharmacological management (non-invasive and invasive oxygenation methods) and medicinal management (antibiotic therapy, corticosteroid therapy, anticoagulation, use or not of hydroxychloroquine, vasopressor amines, and the need or not for extrarenal purification);
- Parameters used to determine the Simplified Gravity Index II (SGI II) and Sequential Organ Failure Assessment (SOFA) severity scores;
- Favorable (survival) or unfavorable (death) outcomes and their time to onset.

Data were entered and processed using Excel© 2019 software. Analysis was performed by describing the sample studied according to sociodemographic, epidemiological, clinical, paraclinical, and therapeutic characteristics. Categorical variables were expressed as percentages, and quantitative variables as mean and standard deviation, as well as median and interquartile range. The Chi-square test was used to verify the association between categorical variables, and the student t-test was used to compare means. The significance threshold was set at $p \leq 0.05$.

Authorization was obtained from the Chief Physician in charge of the OBOATH and the Head of the Anesthesia-Resuscitation Department for access to patient records. Data confidentiality was respected.

3. Results

A total of one hundred and seven (107) patients were included in our study, including 56 men and 51 women, the male/female sex ratio was 1.1. The mean age of the patients was 57.45 years \pm 15.93. The median age was 57 years [IQ = 47.5 – 69.5]. The most represented age group was 46 - 60 years, representing 37.4% of cases. **Figure 1** shows the numbers according to age groups and sex.

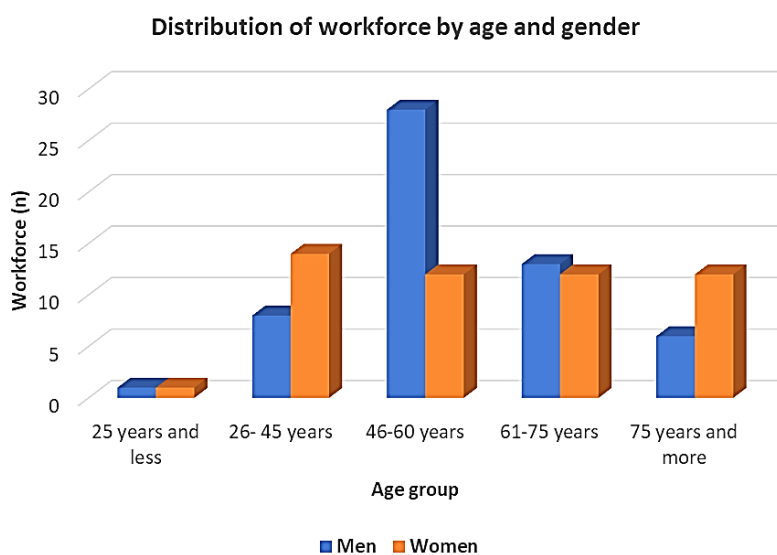


Figure 1. Distribution of patients according to age and sex.

Black race was the most common, accounting for 95.3% of patients. Other racial origins were Caucasian (1.9%), North African (1.9%), and mixed race (0.9%). Body Mass Index (BMI) was calculated for 23 patients, showing 82.6% of them with elevated BMIs.

Patients were admitted to the intensive care unit via the Emergency Department and the OBOATH's Special Unit for the Management of SARS-CoV-2 patients, or via secondary transfers from various healthcare facilities across the country. Only four patients came directly from home.

Among the cardiovascular histories reported, high blood pressure was the main antecedent, accounting for 52.3% of patients. The research of anterior respiratory problems found asthma (2.8%) and neurologically, 6.5% of patients had a history of ischemic stroke. The antecedent of renal history showed 4.6% of patients who had chronic renal failure on dialysis. We found 1.8% of patients who were HIV-positive, one patient was pregnant, 29.0% of the patients were diabetic, and 2.8% of patients had under-gone surgery in the previous month.

Previous functional status, assessed using the Knaus scale, showed that none of our patients were bedridden prior to admission, and 60.7% of patients were receiving ongoing treatment. Patients with at least one vulnerability factor represented 73.8% of our sample. The age group in which we found the most patients with vulnerability factors was 46 - 60 years. **Figure 2** shows the distribution of the most common vulnerability factors.

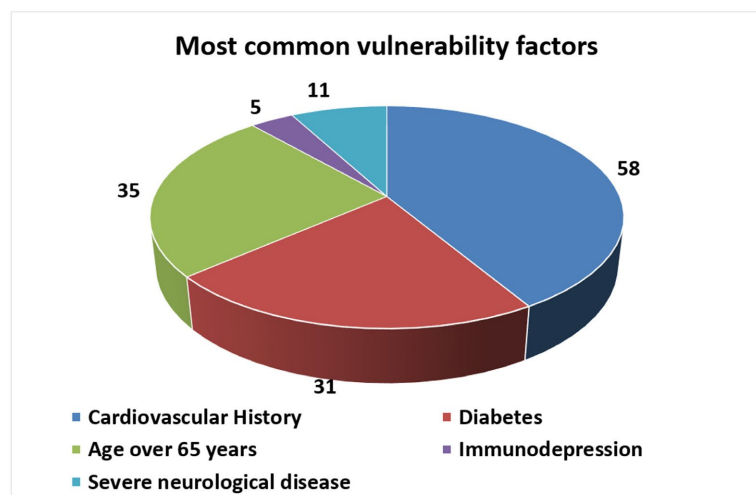


Figure 2. Distribution of patients according to vulnerability factors.

As prodromes, 20.60% of patients presented with flu-like symptoms and 76.60% presented with no common prodrome. Hyperthermia was sought in 69.16% of patients and found in 15.89% of patients in our sample. Asthenia was sought in 98 patients and found in 87 patients. Anorexia was sought in 96 cases and was present in 26 cases.

Cough was the main functional sign, presented by patients with 42.10% of cases, followed by myalgia (7.50%) and chest pain (3.7%). Only one patient presented

with anosmia and ageusia.

Patients with respiratory distress represented 93.46% of the study population. Pulse oxygen saturation ranged from 48% to 100%, with a mean of $86.42\% \pm 10.47$ and a median of 89 [IQ = 80 - 94]. **Figure 3** represents the distribution of patients according to pulse oxygen saturation at admission.

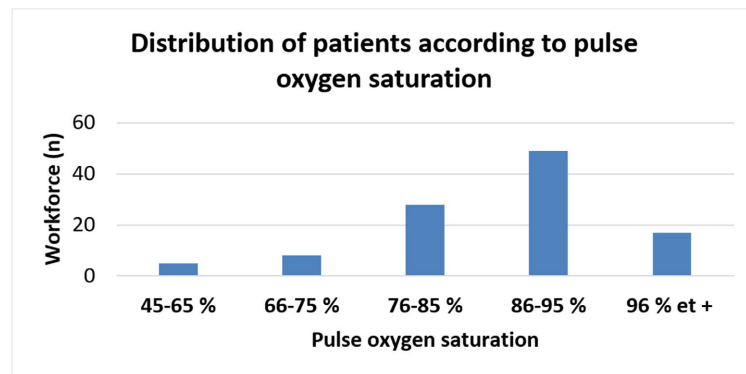


Figure 3. Distribution of patients according to pulse oxygen saturation.

The patients' respiratory rate ranged from 6 to 60 cycles per minute, with a mean of 31.67 ± 9.87 and a median of 30 [IQR = 25 - 40].

Arterial blood gas analysis was performed in 26.17% of patients. Among the results obtained, 57.14% presented hypoxemia ($\text{PaO}_2 < 80$ mmHg) and 21.43% hypercapnia ($\text{PaCO}_2 > 44$ mmHg). The mean PaO_2 was 83.68 ± 37.56 mmHg and the mean PaCO_2 was 36.20 ± 11.19 mmHg.

The Liao score allowed us to assess the patients' severity profile. The mean was 9.61 ± 3.20 , for a median of 9 [IQR = 8 - 11]. The majority of patients had a critical risk profile as shown in **Figure 4**.

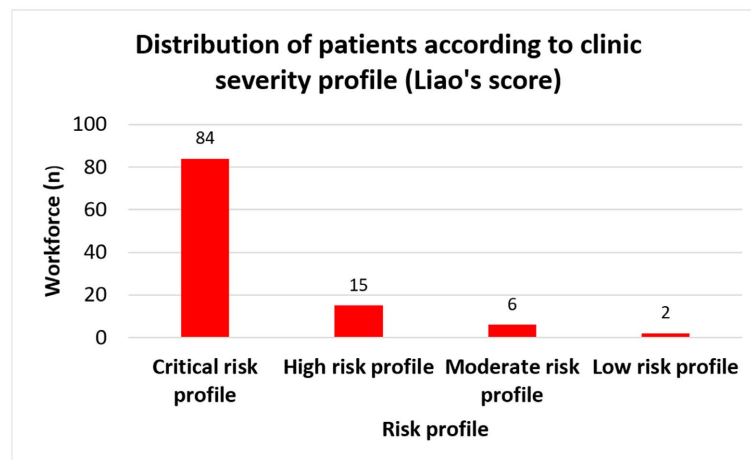


Figure 4. Distribution of patients according to clinic severity profile (Liao's score).

The leukocyte count ranged from 2390 to $37,000/\text{mm}^3$ with a mean of $11,480/\text{mm}^3 \pm 6740.74$ and a median of 10,000 [IQ = 6500 - 14,200]. The he-

moglobin level ranged from 3.3 g/dl to 16.1g/dl with a mean of 11.40 g/dl \pm 2.32 and a median of 11.8 [IQ = 10 - 13]. D-Dimers were performed in 31 patients and showed a mean of 3211.31 ng/dl \pm 2911.46 and a median of 2234 [IQ = 1006.26 - 4555.01].

The paraclinical biological diagnosis of SARS-CoV-2 disease was made by performing a Rapid Diagnostic Test (RDT), serology, and/or RT-PCR. In our sample, 40.19% of patients underwent an RDT, 4.67% a serology test, and 30.84% a PCR test. Among patients who underwent a PCR test, the result was positive in 75.76% of cases.

Chest computed tomography (CT) scans were performed on 85.98% of patients in our sample, and 91.30% underwent it within 24 hours. Depending on the extent of the lesions observed, a percentage of invasion was determined by the facility's radiologist, showing CT-scanned lung invasion greater than 50% in 78.2% of patients. CT lesions were mainly represented by ground-glass images (70.65%) and a "crazy paving" appearance in 14.13% of the chest CT scans performed. Two patients had no visible lesions (**Figure 5**).

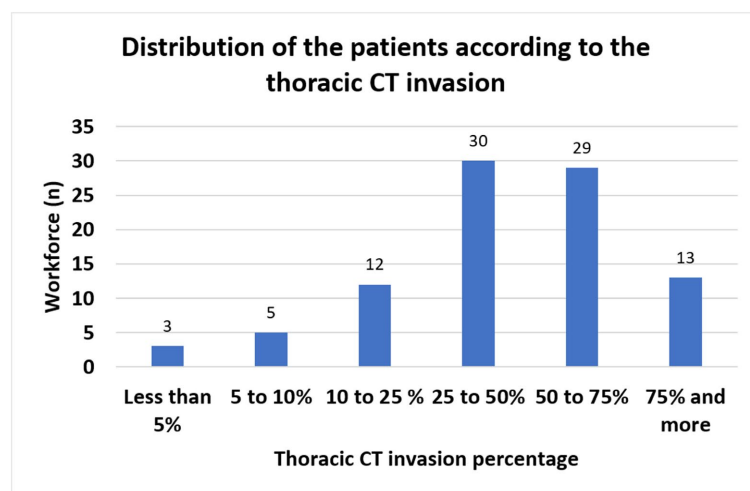


Figure 5. Distribution of the patients according to the thoracic CT invasion.

The SGI II score was used to assess disease severity. We found scores ranging from 6 to 82, with a mean of 31.05 \pm 12.85 and a median of 29 [IQ = 22.5 - 38], representing an average predicted mortality of 12.8%. Although the majority of patients had a predicted mortality of less than 20%, the highest scores were found in the age group over 60 years.

According to the national protocol in force in Gabon, treatment began immediately, and 35.5% of patients received dual antibiotic therapy combining a third-generation cephalosporin and azithromycin. Anticoagulation was initiated in 95.3% of patients, and 85% of them were receiving curative doses of anticoagulants. None of the patients received a prescription for hydroxychloroquine.

Vascular amines were required in 3.74% of patients, and 5.61% required dialysis during their hospitalization.

The minimum length of stay for patients in the intensive care unit was 24 hours and the maximum length of stay was 32 days, with a mean of 5.93 days \pm 4.95 and a median of 5 [IQR = 3 - 8]. In the study, we recorded 43.9% of deaths.

4. Discussion

This descriptive, retrospective, single-center study aimed to describe the epidemiological characteristics of patients with coronavirus disease admitted to the intensive care unit of the Omar BONGO ONDIMBA Military Training Hospital.

Nevertheless, the results of our study must be interpreted with certain methodological limitations in mind. First, as a retrospective study, we faced constraints related to data collection. Second, our study was single-center, making it difficult to extrapolate the data collected to the general population. Finally, some variables were missing due to poor record keeping in this pandemic context with intense clinical activity during the crisis. Finally, there was sporadic inadequacy of the available technical equipment, particularly for arterial blood gas analysis and even computed tomography.

However, our study represents a significant cohort, and the data obtained deserve to be presented and compared with the literature.

The mean age was 57.45 ± 15.93 years. The most representative age group was 46 to 60 years, comprising 37.4% of patients. The results of a study conducted at the University Hospital of Libreville found a mean age of 53.5 ± 15.5 years with extremes of 16 and 90 years [9]. A thesis carried out at the Akanda Army Training Hospital highlighted a mean age of 57 ± 17 years [10]. Another Gabonese study found the same average age for patients included in general and even those admitted to intensive care units [6]. Our results are almost similar to those obtained by Donamou J. *et al.* at the DONKA hospital in Guinea Conakry where the mean age was 59 ± 14 years.

The results of a study conducted by the COVID-ICU group showed that the median age of patients admitted to intensive care was 63 years [11]. This median age is higher than that found in our study (57 years), and is close to that found by Gundogan *et al.* (67 years) [12].

This age difference between continents is explained by a relatively young African population, unlike the European and American populations.

The study population was predominantly male with a sex ratio (M/F) of 1.1. This male predominance has been reported by several studies such as that of Gundogan *et al.* in Turkey (59.6% with $n = 421$) [12], that of Giacomo Grasselli *et al.* in Lombardy (82% with $n = 1591$) [13].

Studies have attempted to explain the gender difference in COVID-19 mortality by a higher expression of the ACE2 receptor that has been found in Asian men [14].

Paradoxically, if tissue expression of ACE2 allows the virus to penetrate the cell, the soluble form of ACE2 could be a protective factor against COVID-19. Circulating ACE2 activity is indeed low in overweight or hypertensive patients, whereas

it is higher in children and is positively correlated with estrogen expression [15].

This explains, for some authors, the relative protection of children compared to adults and of women compared to men in COVID-19 [16]. This is confirmed in the study, where, even if patients under 15 years of age were not included, no patient in this age group presented to the structure with moderate or severe symptoms of SARS-CoV-2 infection.

The assessment of previous functional status using the Knaus score found 60.7% of patients with a B score, corresponding to the presence of chronic treatment. These results show that more than half of the patients had defects, which likely made them more prone to developing a severe form of COVID-19 disease.

The presence of comorbidities, such as diabetes, hypertension, heart disease, chronic lung disease and cancer, have been described as risk factors for severe disease that may lead to hospitalization in intensive care. In Gabon first, Iroungou *et al.* found that history of diabetes was significantly more common in patients with severe symptoms than in patients with mild symptoms and those with no symptoms (0.9%), whether these factors were considered overall or separately [6]. In Guinea Conakry, Donamou *et al.* found 77% of patients with at least one comorbidity [17]. This result is higher than that found by Chen *et al.* (50.5%) [18] Merabet *et al.* (69%) and Vanhems *et al.* (69.4%) [19] [20] but lower than that found by Gundogan *et al.* (87.6%) [12], and Bay (80%) [21]. The most common comorbidities found in the series were hypertension and diabetes with 52.3% and 29.0% of patients affected respectively. Our results corroborate the data in the literature.

Multiple explanations can be put forward for the apparent association of pre-existing diabetes and the severity of COVID-19. Hyperglycemia and insulin resistance promote increased synthesis of glycosylation end products and pro-inflammatory cytokines, and this inflammatory process may be the underlying mechanism leading to a greater propensity for infection. Finally, the high expression of ACE2 in these patients may expose them to severe forms of infection [22].

According to a systematic review with meta-analysis on the clinical characteristics of COVID-19 in China, common symptoms among ICU patients were fever (50% - 98%), fatigue (38%), cough (66% - 88%), dyspnea (63.5% - 88%), and sputum production (42%) [23]. In the study by Cummings *et al.* [24] in the United States, they found a predominance of dyspnea (74%), followed by cough (66%) and myalgia (26%).

In the series, we found a predominance of respiratory distress (93.46%), fatigue (81.3%), and cough (42.10%). Our results are roughly similar to the results reported by these studies and confirm the consistency of dyspnea and cough found in the literature.

COVID-19 is a progressive disease. Some patients may progress from a mild illness to a phase of worsening symptoms that can lead to ARDS or even organ failure. The occurrence of ARDS in the context of COVID-19 is widely reported. It is responsible for a mortality rate of 40 to 50% depending on the country [25]

[26]. According to the medical journal *The Lancet*, it is the main cause of death from COVID-19 [27]. In the study, the occurrence of ARDS was confirmed in 78.5% of patients who underwent arterial blood gas analysis. This result corroborates those found in the literature: 87.3% by Grasselli *et al.* in Italy [25], 76.1% by Tan *et al.* in a systematic review with meta-analysis [28], 63.2% by Mitra *et al.* in Canada [29].

COVID-19 is associated with several biological abnormalities. Its pathophysiology appears complex and still poorly understood. Indeed, several meta-analyses have revealed heterogeneity in the expression of the biological profile in severe COVID-19 patients [30] [31].

In the study, we found a mean leukocyte count of $11,480 \pm 6740.74/\text{mm}^3$. Doumbia in Mali found a mean of $13,850 \pm 9360/\text{mm}^3$ [32] and Donamou in Conakry found hyperleukocytosis in 84% of cases [17]. This may be explained by possible bacterial superinfections, which are conducive to developing on a weakened terrain of viral pneumonia.

In the literature, D-dimer levels have been reported to be elevated in COVID-19 patients in general. A systematic review with meta-analysis published in 2020 reported that this elevation was associated with severe disease [24]. The mean D-dimer level in the study was 3211.31 ± 2911.46 ng/ml, similar to Doumbia in Mali, Gundogan *et al.* in Turkey, Ortiz-Brizuela *et al.* in Mexico, and Mitra *et al.* in Canada [17] [29] [32] [33]. The mechanism leading to this D-dimer elevation is not yet clearly understood. There is a dynamic correlation between elevated D-dimer levels and the occurrence of thromboembolic events in these patients [31]. In Gabon, a study focusing only on thromboembolic manifestations in patients with severe forms of SARS-CoV-2 found them in almost 11% of cases, confirming the fact that the incidence of thrombotic manifestations in patients with COVID-19 remains high, thus justifying the systematic prescription of prophylactic, or even curative, anticoagulation [8].

RT-PCR plays a critical role in determining hospitalization and isolation of individual patients. However, its lack of sensitivity, insufficient stability, and relatively long processing time have hampered the control of the disease outbreak. In addition, a number of external factors may affect the results of RT-PCR tests, including sampling operations, sample source (upper or lower respiratory tract), sampling time (different period of disease development), and detection kit performance. As such, RT-PCR test results should be interpreted with caution [34].

In our sample, less than half of the patients had received a PCR test. A positive PCR result was found in 75.76% of cases, when it was performed. In another study, a cohort in America, patients were repeatedly negative on RT-PCR for SARS-CoV-2, despite presenting a range of typical signs and/or symptoms associated with COVID [24]. Furthermore, another retrospective Chinese study that aimed to compare the sensitivity and specificity of RT-PCR and chest CT, revealed that the sensitivity of chest CT is estimated at 97%, and the specificity at 25%, compared to a sensitivity of 65% and a specificity of 83% for RT-PCR [35]. These results suggest that a negative RT-PCR test should not preclude COVID treatment

in the presence of clinical suspicion of the disease, which was done in the study, clinical and CT parameters were considered sufficient to retain the diagnosis.

Chest CT is a conventional, non-invasive imaging modality with high accuracy and speed. It is considered a screening and early diagnostic tool in COVID-19 pneumonia [35].

In this series, CT was performed in 85.98% of patients. Ground-glass appearance was the most common radiological lesion at 70.65%, followed by crazy paving, which represented 14.13%. These results are similar to those of Marc Garnier *et al.*, in France, who found ground-glass appearance in 68 to 83% of cases, followed by crazy paving lesions in 15% to 34% [36]. Extension of lesions on chest CT to more than 75% was found in 14.13% of patients. The main CT sign of severity is the extent of parenchymal abnormalities on the initial CT scan. Many studies report a correlation between the extent of lesions and clinical severity [37]-[39].

To date, no specific treatment has been recommended for coronavirus infection. Treatment varies from one country to another depending on the established national protocol. Data from the literature and the WHO agree that corticosteroids, particularly dexamethasone, reduce the number of deaths in intensive care [40]. Other treatments such as antivirals, antibiotics and anticoagulants vary in use from one country to another. In Gabon, the management of severe forms of covid-19 has been codified and a protocol has been implemented by the Coronavirus Monitoring and Response Committee (COPIL) which systematically combines: oxygen therapy, antibiotic therapy, corticosteroid therapy, anticoagulation and vitamin therapy [41].

The management of patients with respiratory failure due to SARS-CoV-2 pneumonia focuses on respiratory support, using several modalities that constitute the corner-stone of treatment for acute respiratory distress syndrome [42].

In the study, 45.79% of patients received conventional oxygen therapy, 43.93% received non-invasive ventilation (NIV), and 6.42% received mechanical ventilation.

In our series, antibiotic therapy was routinely used in accordance with the current national protocol [41]. This consisted of dual antibiotic therapy combining ceftriaxone and azithromycin. A fluoroquinolone could be added, along with other molecules, in case of obvious signs of bacterial superinfection or in patients receiving mechanical ventilation.

This protocol is different from that of Morocco which recommends the combination of Hydroxychloroquine-Azithromycin as a first-line treatment, then antivirals as a second line. Antibiotics are only recommended if there is evidence of bacterial superinfection [43].

The risk of thromboembolic events in COVID-19 patients admitted to intensive care appears very high due to the presence of risk factors, including age, comorbidities, prolonged bed rest, and the pathophysiology of the disease. In an update published by Satre Buisson in September 2020, anticoagulant treatment for

prophylactic purposes or at higher or even curative doses, taking into account the risk of bleeding, is widely recommended in patients with COVID-19, in order to limit the impact of hypercoagulability induced by SARS-CoV-2 infection [44]. In this series, the majority of patients received curative doses of anticoagulation in the absence of contraindications.

Circulatory failure reflects the critical condition of our patients, resulting in the transition to septic shock. The management of septic shock in patients with COVID-19 is not specific and strictly follows the recommendations of the Surviving Sepsis campaign [45]. In the series, we used vasoactive amines in 3.74% of patients. In France, during the first 3 years of the epidemic, 27% of patients required the administration of catecholamines [46].

The average length of hospitalization of patients was 5.93 days. This result is close to that found in France where the average length of hospitalization was 7 days [46]. Lower than that reported in China (10 days) [47] and in Conakry (12 days) [17]. The length of hospitalization varies depending on the severity of the patients' condition but also on the care methods specific to each healthcare establishment which may or may not extend the stay of its patients.

Literature data have shown high mortality among patients with severe forms of COVID-19. In terms of numbers, this mortality appears quite heterogeneous. A mortality rate of 15.4% has been reported in Vancouver, 25% in Conakry, 55.1% in Turkey, and 85% in Algeria [12] [17] [19] [29]. In the study, the mortality rate was 43.93%. This heterogeneity may reflect the heterogeneity of patients based on their age, comorbidity, superinfection rate, and treatment time.

5. Conclusions

The SARS-CoV-2 disease, when it emerged in November 2019, plunged the world into a veritable health crisis. Although its clinical presentation is polymorphic and despite numerous limitations, including significant missing data, this study allowed us to better understand the typology of patients admitted to intensive care of Libreville for the management of SARS-CoV-2 pneumonia.

The majority of patients were men, between 46 and 60 years of age with comorbid hypertension. Admission to intensive care occurred due to respiratory distress, with imaging findings of lesions typical of SARS-CoV-2 pneumonia on 75% of the CT scans.

To date, there is no evidence of effective treatment for COVID-19. Treatment is symptomatic, focusing on respiratory support, corticosteroid therapy, antibiotic therapy, and heparin therapy. Since the start of vaccination, cases of COVID-19 appear to be declining. This led to the WHO lifting the global health emergency on May 5, 2023, while reiterating that the virus has neither been eradicated nor rendered harmless. We must, therefore, remain cautious by maintaining barrier measures while preparing response programs to deal with other possible epidemics due to the emergence of a new variant. The evidence is that the endemic nature of the disease is proven, with the admission of an average of 5 to 6 patients with

severe COVID-19 per year to our facility in 2024.

Finally, with the aim of improving and anticipating patient care, similar studies in other university hospitals in the capital should be conducted to support the epidemiological findings and determine the risk factors associated with severe forms of COVID-19 specific to the Gabonese population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Virus respiratoires émergents y compris le COVID-19: Méthodes de détection, de prévention, de réponse et de contrôle.
- [2] Liu, Y.-C., *et al.* (2020) COVID-19: The First Documented Coronavirus Pandemic in History. *Biomedical Journal*, **43**, 328-333. <https://pubmed.ncbi.nlm.nih.gov/32387617/>
- [3] Desvaux, É. and Faucher, J. (2020) COVID-19: Aspects cliniques et principaux éléments de prise en charge. *Revue Francophone des Laboratoires*, **2020**, 40-47. [https://doi.org/10.1016/s1773-035x\(20\)30312-9](https://doi.org/10.1016/s1773-035x(20)30312-9)
- [4] Louvet, B. (2020) Recommandations d'experts portant sur la prise en charge en Réanimation des patients en période d'épidémie à SARS-CoV-2-La SFAR.
- [5] Nouveau Coronavirus (2019-nCoV). <https://www.who.int/fr/emergencies/diseases/novel-coronavirus-2019>
- [6] Iroungou, B.A., Mangouka, L.G., Bivigou-Mboumba, B., Moussavou-Boundzanga, P., Obame-Nkoghe, J., Nzigou Boucka, F., *et al.* (2021) Demographic and Clinical Characteristics Associated with Severity, Clinical Outcomes, and Mortality of COVID-19 Infection in Gabon. *JAMA Network Open*, **4**, e2124190. <https://doi.org/10.1001/jamanetworkopen.2021.24190>
- [7] Moustapha, D., Papa Samba, B., Moustapha, L., Ndong, E., Betty, F., Mathilde Ndèye, S., *et al.* (2021) Factors Associated with Severe COVID-19 in an Epidemic Treatment Center at Dakar. *Journal of Infectious Diseases and Epidemiology*, **7**, Article No. 203. <https://doi.org/10.23937/2474-3658/1510203>
- [8] Mendome, I., *et al.* (2023) Aspects épidémiocliniques des manifestations thrombotiques au cours de la COVID-19 au sein des hôpitaux militaires de Libreville et d'Akanda, Gabon. *Revue Anesthésie-réanimation Médecine Urgence et Toxicologie*, **15**, 138-143.
- [9] Ngomas, J.F., *et al.* (2022) Epidemiology and Poor Prognostic Factors of Patients with COVID-19 Admitted in the Intensive Care Unit of the University Teaching Hospital of Libreville during the First Three Waves of the Pandemic. *Health Sciences and Disease*, **23**, 1-7. <https://www.hsd-fmsb.org>
- [10] Bikanga, B.R. (2021) Covid-19 au Gabon: Expérience au Service de Réanimation de l'hôpital d'Instruction des Armées d'Akanda. Thèse de Doctorat d'état en Médecine dirigé par le Pr MANDJI Lawson Université des Sciences de la Santé, 64 p.
- [11] COVID-ICU Group (2020) Clinical Characteristics and Day-90 Outcomes of 4244 Critically Ill Adults with COVID-19: A Prospective Cohort Study. *Intensive Care Medicine*, **47**, 60-73. <https://doi.org/10.1007/s00134-020-06294-x>
- [12] Gündogan, K., Akbudak, I.H., Hanci, P., Halaçli, B., *et al.* (2021) Clinical Outcomes and Independent Risk Factors for 90-Day Mortality in Critically Ill Patients with Res-

- piratory Failure Infected with SARS-CoV-2: A Multicenter Study in Turkish Intensive Care Units. *Balkan Medical Journal*, **38**, 296-303.
- [13] Grasselli, G., *et al.* (2020) Baseline Characteristics and Outcomes of 1591 Patients Infected with SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. *JAMA*, **323**, 1574-1581.
- [14] Zheng, Q., Duan, T. and Jin, L. (2020) Single-Cell RNA Expression Profiling of ACE2 and AXL in the Human Maternal-Fetal Interface. *Reproductive and Developmental Medicine*, **4**, 7-10. <https://doi.org/10.4103/2096-2924.278679>
- [15] Zhang, Q., Cong, M., Wang, N., Li, X., Zhang, H., Zhang, K., *et al.* (2018) Association of Angiotensin-Converting Enzyme 2 Gene Polymorphism and Enzymatic Activity with Essential Hypertension in Different Gender: A Case-Control Study. *Medicine*, **97**, e12917. <https://doi.org/10.1097/md.00000000000012917>
- [16] Ciaglia, E., Vecchione, C. and Puca, A.A. (2020) COVID-19 Infection and Circulating ACE2 Levels: Protective Role in Women and Children. *Frontiers in Pediatrics*, **8**, Article No. 206. <https://doi.org/10.3389/fped.2020.00206>
- [17] Donamou, J., Bangoura, A., Camara, L.M., Camara, D., Traoré, D.A., Abékan, R.J.-M., *et al.* (2021) Caractéristiques épidémiologiques et cliniques des patients COVID-19 admis en réanimation à l'hôpital Donka de Conakry, Guinée: Étude descriptive des 140 premiers cas hospitalisés. *Anesthésie & Réanimation*, **7**, 102-109. <https://doi.org/10.1016/j.anrea.2021.01.001>
- [18] Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., *et al.* (2020) Epidemiological and Clinical Characteristics of 99 Cases of 2019 Novel Coronavirus Pneumonia in Wuhan, China: A Descriptive Study. *The Lancet*, **395**, 507-513. [https://doi.org/10.1016/s0140-6736\(20\)30211-7](https://doi.org/10.1016/s0140-6736(20)30211-7)
- [19] Merabet, A., Ogal, T. and Louani, Y. (2021) Analyse descriptive du profil des patients COVID-19 admis en réanimation médicale au CHU de Tizi-Ouzou, Algérie en vue de l'amélioration de la pratique clinique. <https://www.ummt0.dz/dspace/handle/ummt0/14909>
- [20] Vanhems, P., Gustin, M., Elias, C., Henaff, L., Dananché, C., Amour, S., *et al.* (2020) Caractéristiques cliniques et facteurs associés à l'admission en unités de soins intensifs chez des patients COVID-19 hospitalisés. *Médecine et Maladies Infectieuses*, **50**, S81-S82. <https://doi.org/10.1016/j.medmal.2020.06.163>
- [21] Bay Bay, Y. (2021) Caractéristiques des patients COVID-19 admis en service de réanimation à l'hôpital Ibn Sina de Rabat: Étude descriptive à propos de 230 cas. Thesis. <http://ao.um5.ac.ma/xmlui/handle/123456789/19035>
- [22] Rao, S., Lau, A. and So, H. (2020) Exploring Diseases/Traits and Blood Proteins Causally Related to Expression of ACE2, the Putative Receptor of SARS-CoV-2: A Mendelian Randomization Analysis Highlights Tentative Relevance of Diabetes-Related Traits. *Diabetes Care*, **43**, 1416-1426. <https://doi.org/10.2337/dc20-0643>
- [23] Fu, L., Wang, B., Yuan, T., Chen, X., Ao, Y., Fitzpatrick, T., *et al.* (2020) Clinical Characteristics of Coronavirus Disease 2019 (COVID-19) in China: A Systematic Review and Meta-Analysis. *Journal of Infection*, **80**, 656-665. <https://doi.org/10.1016/j.jinf.2020.03.041>
- [24] Cummings, M.J., Baldwin, M.R., Abrams, D., Jacobson, S.D., Meyer, B.J., Balough, E.M., *et al.* (2020) Epidemiology, Clinical Course, and Outcomes of Critically Ill Adults with COVID-19 in New York City: A Prospective Cohort Study. *The Lancet*, **395**, 1763-1770. [https://doi.org/10.1016/s0140-6736\(20\)31189-2](https://doi.org/10.1016/s0140-6736(20)31189-2)
- [25] Grasselli, G., Greco, M., Zanella, A., *et al.* (2020) Risk Factors Associated with Mortality among Patients with COVID-19 in Intensive Care Units in Lombardy, Italy.

JAMA Internal Medicine, **180**, 1345-1355.

- [26] Gupta, S., Hayek, S.S., Wang, W., Chan, L., Mathews, K.S., Melamed, M.L., *et al.* (2020) Factors Associated with Death in Critically Ill Patients with Coronavirus Disease 2019 in the Us. *JAMA Internal Medicine*, **180**, 1436-1447. <https://doi.org/10.1001/jamainternmed.2020.3596>
- [27] Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., *et al.* (2020) Clinical Features of Patients Infected with 2019 Novel Coronavirus in Wuhan, China. *The Lancet*, **395**, 497-506. [https://doi.org/10.1016/s0140-6736\(20\)30183-5](https://doi.org/10.1016/s0140-6736(20)30183-5)
- [28] Tan, E., Song, J., Deane, A.M. and Plummer, M.P. (2021) Global Impact of Coronavirus Disease 2019 Infection Requiring Admission to the ICU. *Chest*, **159**, 524-536. <https://doi.org/10.1016/j.chest.2020.10.014>
- [29] Mitra, A.R., Fergusson, N.A., Lloyd-Smith, E., Wormsbecker, A., Foster, D., Karpov, A., *et al.* (2020) Caractéristiques de départ et issues chez des patients atteints de COVID-19 hospitalisés dans des unités de soins intensifs à Vancouver (Canada): Série de cas. *Canadian Medical Association Journal*, **192**, E1550-E1558. <https://doi.org/10.1503/cmaj.200794-f>
- [30] Mudatsir, M., Fajar, J.K., Wulandari, L., Soegiarto, G., Ilmawan, M., Purnamasari, Y., *et al.* (2021) Predictors of COVID-19 Severity: A Systematic Review and Meta-Analysis. *F1000Research*, **9**, Article No. 1107. <https://doi.org/10.12688/f1000research.26186.2>
- [31] Lin, J., *et al.* (2021) COVID-19 and Coagulation Dysfunction in Adults: A Systematic Review and Meta-Analysis. *Journal of Medical Virology*, **93**, 934-944.
- [32] Doumbia, A. (2022) Patients COVID-19 en réanimation: Facteurs de risque de mortalité. <https://www.bibliosante.ml/handle/123456789/5474>
- [33] Ortiz-Brizuela, E., Villanueva-Reza, M., González-Lara, M.F., Tamez-Torres, K.M., Román-Montes, C.M., Díaz-Mejía, B.A., *et al.* (2020) Clinical and Epidemiological Characteristics of Patients Diagnosed with COVID-19 in a Tertiary Care Center in Mexico City: A Prospective Cohort Study. *Revista de Investigación Clínica*, **72**, 165-177. <https://doi.org/10.24875/ric.20000334>
- [34] Li, Y., Yao, L., Li, J., Chen, L., Song, Y., Cai, Z., *et al.* (2020) Stability Issues of RT-PCR Testing of SARSCoV-2 for Hospitalized Patients Clinically Diagnosed with COVID-19. *Journal of Medical Virology*, **92**, 903-908. <https://doi.org/10.1002/jmv.25786>
- [35] Ai, T., Yang, Z., Hou, H., Zhan, C., Chen, C., Lv, W., *et al.* (2020) Correlation of Chest CT and RT-PCR Testing for Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases. *Radiology*, **296**, E32-E40. <https://doi.org/10.1148/radiol.2020200642>
- [36] Garnier, M., Quesnel, C. and Constantin, J. (2021) Atteintes pulmonaires liées à la COVID-19. *La Presse Médicale Formation*, **2**, 14-24. <https://doi.org/10.1016/j.lpmfor.2020.12.009>
- [37] Xiong, Y., Sun, D., Liu, Y., Fan, Y., Zhao, L., Li, X., *et al.* (2020) Clinical and High-Resolution CT Features of the COVID-19 Infection: Comparison of the Initial and Follow-Up Changes. *Investigative Radiology*, **55**, 332-339. <https://doi.org/10.1097/rli.0000000000000674>
- [38] Li, K., Wu, J., Wu, F., Guo, D., Chen, L., Fang, Z., *et al.* (2020) The Clinical and Chest CT Features Associated with Severe and Critical COVID-19 Pneumonia. *Investigative Radiology*, **55**, 327-331. <https://doi.org/10.1097/rli.0000000000000672>
- [39] Yang, R., Li, X., Liu, H., Zhen, Y., Zhang, X., Xiong, Q., *et al.* (2020) Chest CT Severity

- Score: An Imaging Tool for Assessing Severe COVID-19. *Radiology: Cardiothoracic Imaging*, **2**, e200047. <https://doi.org/10.1148/ryct.2020200047>
- [40] RECOVERY Collaborative Group (2021) Dexamethasone in Hospitalized Patients with Covid-19. *New England Journal of Medicine*, **384**, 693-704. <https://doi.org/10.1056/nejmoa2021436>
- [41] COPIL (2022) Protocole National de la prise en charge des cas sévères et critiques de la Covid-19 en réanimation.
- [42] Netgen (2020) COVID-19: Prise en charge aux soins intensifs. *Revue Médicale Suisse*, **16**, 863-868.
- [43] Bay Bay, Y. (2021) Caractéristiques des patients COVID-19 admis en services de réanimation à l'hôpital Ibn Sina de Rabat: Étude descriptive à propos de 230 cas.
- [44] Satre Buisson, L. (2020) Coagulopathie associée au COVID-19: Les éléments essentiels pour l'anesthésiste-réanimateur. *Le Praticien en Anesthésie Réanimation*, **24**, 190-195. <https://doi.org/10.1016/j.pratan.2020.07.007>
- [45] Rhodes, A., Evans, L.E., Alhazzani, W., *et al.* (2017) Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Intensive Care Medicine*, **43**, 304-377.
- [46] Naouri, D., *et al.* (2022) COVID-19: Prise en charge des patients en soins critiques au cours des trois premières vagues de l'épidémie. Études et résultats, 1226.
- [47] Zhang, H., Shang, W., Liu, Q., Zhang, X., Zheng, M. and Yue, M. (2020) Clinical Characteristics of 194 Cases of COVID-19 in Huanggang and Taian, China. *Infection*, **48**, 687-694.