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RESEARCH ARTICLE

COVID-19: Experience of the Epidemic Treatment Center in Ziguinchor, Southern Region of Senegal

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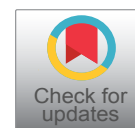
Abstract

Background: The 2019 coronavirus disease (COVID-19) started in December 2019 in China and has become few months later, a public health emergency of international concern, then became a pandemic. In Senegal, the first cases were declared in March 2020. The purpose of this study was to describe the epidemiological and clinical characteristics of the disease in Ziguinchor, southern region of Senegal and to identify the factors associated with the death of the cases.

Methods: Descriptive and analytical cross-sectional study on all patients infected with COVID-19 confirmed by RT-PCR and admitted to the epidemic treatment center (ETC) of Ziguinchor from March 23rd to November 30th, 2020.

Results: A total of 285 patients were admitted to the ETC during the study period. The sex ratio (M/F) was 1.3 with an average age of 45 ± 21 years [0-87 years]. The most common initial symptoms were fever 125 (43.9%), cough 112 (39.3%) and dyspnea 73 (25.6%). Mild to moderate forms represented 146 (51.2%) of cases, alongside asymptomatic forms 82 (27.7%) and severe forms 57 (20%). The most common comorbidities were Hypertension 62 (21.7%) and diabetes 34 (11.9%). In univariate analysis, diabetes, underlying cardiovascular or respiratory disease, renal failure, leukocytosis (> 10,000/mm³, creatinine clearance (< 60 ml/min) were significantly more common (p < 0.05) in patients on critical phase or deceased. In multivariate analysis, only the age of 60 years and beyond (OR = 4.43; CI 95% [1.12-17.40]), oxygen saturation ≤ 92% (OR = 16.28; CI 95% [4.43-59.86]) were associated with death.

Conclusion: The mild to moderate forms were more frequent in our patients, mostly under 60 years of age. The risk of death was greater in the elderly and those with severe hypoxemia.

Keywords

Covid-19, Ziguinchor, Senegal

Introduction

Since the emergence in December 2019 of SARS-CoV-2 the virus responsible for Covid-19 in Hubei

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province, China, the world has been going through a global crisis [1-3]. With more than 150 million cases and 3.2 million deaths, Covid-19 has become a public health emergency of international concern and the first large-scale pandemic of the 21st century [2,3]. Although the clinical expression is mild in approximately 80% of cases [1-5], Covid-19 can be particularly serious and fatal in certain individuals such as the elderly or those with certain comorbidities [3,4]. The virus is human-to-human transmitted especially by the respiratory route [6]. To this date, there is no formal evidence of an effective treatment and the benefit of chloroquine, a widely used molecule, is controversial [7]. Senegal confirmed its first case on March 2nd, 2020 and immediately put in place a response strategy based on its experience in managing the Ebola virus epidemic in 2014. The Ministry of Health and Social Action coordinated through its Health Emergency Operations Center (HEOC) which drafted all the standard operation procedures for the detection, the notification and the management of cases in accordance with the recommendations from WHO, CDC, scientific societies and experts' advices [8]. Epidemic treatment centers (ETC) have been opened in every region of the country for the management of cases. The decision to set up the Ziguinchor ECT was taken on March 17th, 2020 and the first case was hospitalized on March 22nd, 2020. The management of the epidemic at the regional level was ensured by a regional epidemic management committee involving the various administrative and security services of the government. The management aspects were provided by a technical committee for the management of the epidemic (CTGE) which included medical and affiliated services in a "One Health" approach. The ETC coordinator, his deputy and the director of the hospital where it was housed were members of that committee, along with the medical officers of the health districts and the region's chief medical officer. The objective of this study is to describe the epidemiological and clinical characteristics of the disease in Ziguinchor, a region located in the south of the country and to identify the factors associated with the death of the cases.

Methods

This was a descriptive and analytical cross-sectional study of all patients infected by COVID-19 confirmed with RT-PCR and admitted to the epidemic treatment center (ECT) of Ziguinchor from March to November 2020. The CTEpi was housed in the Regional Hospital of Ziguinchor (RHZ). The building was renovated to accommodate Covid-19 patients. It includes a green zone for staff and material storage and a red zone for patients' hospitalization. The admission capacity of the center was 38 beds, including 6 resuscitation beds with wall oxygen. A video-surveillance system made it possible to closely observe the monitors of severe patients. The management teams consisted of infectious

disease doctors, a pulmonologist, a resuscitator, general practitioners, nurses, hygiene officers and surface technicians. Team members have been trained on the various aspects of Covid-19 management, the prevention and the control (PCI) measures.

Diagnostic methods

Case definition: The definition of cases in effect during this period distinguished between the situations:

- **Suspected cases:** Clinical symptoms compatible with Covid-19, without any other apparent cause.

- **Confirmed cases*:** Detection of SARS-CoV-2 nucleic acids OR death with compatible clinical manifestations observed before death AND detection of SARS-CoV-2 nucleic acids.

- **Cases confirmed by epidemiological link**:** Clinical symptoms compatible with COVID-19 AND high-risk exposure** with one laboratory-confirmed case during its period of contagiousness, AND no other apparent cause OR death with compatible clinical manifestations1 observed before death AND high-risk exposure** with one laboratory-confirmed case during its contagious period, and no other apparent cause.

- **Severe forms:** No definition of severe forms has been validated. The definitions of non-severe and severe forms are heterogeneous according to the studies. The Chinese National Health Commission [9] has proposed the following criteria: respiratory rate > 30/min, pulsed oxygen saturation ≤ 93%, PaO_2/FiO_2 ≤ 300 mmHg, respiratory distress and need for mechanical ventilation, signs of shock, organ failure requiring intensive care.

- **Confirmatory diagnosis:** Case diagnosis was made from a nasopharyngeal swab sample in accordance with current recommendations, either from symptomatic suspected cases or from contacts of confirmed cases. The samples were then sent to the Pasteur Institute in Dakar for the performance of a real-time RT-PCR test specific to SARS-CoV-2. A standardized survey form was associated with each sample. The survey form included socio-demographic and clinical information on patients as well as their exposure history (contact with a confirmed case or travel history to the Covid-19 epidemic area).

Data collection

The data was entered using Epi Data 3.1 software and analyzed using the Stata 11.3 software. Comparison of proportions was performed using Fisher's exact test, chi-square test, and linear trend chi-square test as indicated. The significance level was 0.05 and the confidence interval was 95%. Factors associated with Covid-19-related death were determined by univariate analysis using binomial regression. The multivariate model was constructed from variables with a significance level less than or equal to 0.05 in univariate analysis due

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to the exploratory nature of our study. The final model consisted of the variables which, in the multivariate model, had a value less than 0.05.

Ethical considerations

Table 1: Distribution of patients with COVID-19 according to the comorbidities.

Comorbidities	Frequency (n)	Percentages (%)
Hypertension	62	21.75
Diabetes mellitus	34	11.93
Brain Stroke	12	04.21
Asthma	10	03.51
Chronic kidney disease	06	02.10
Obésity	04	01.40
Heart disease	04	01.40
Infection à VIH	02	0.70
COPD*	01	0.35
Psychosis	01	0.35

*Chronic Obstructive Pulmonary Disease

Table 2: Distribution of patients with COVID-19 according to their symptoms in the ECT (N = 285).

Variables	Frequency (n)	Percentages (%)
Asymptomatic	82	27.77
Fever	125	43.86
Cough	112	39.30
Dyspnae	73	25.61
Polyarthralgia	72	25.26
Headaches	53	18.60
Runing nose	42	14.74
Dysgueusie	33	11.58
Anosmia	29	10.18
Confusion	16	05.61
Sore throat	15	05.26
Diarrhea	08	02.81
Asthenia	10	03.40
Abdominal pain	08	02.81
Coma	08	02.81
Vomiting	07	02.46
Anorexia	06	02.04
Nausea	01	0.35

Informed consent was obtained from all participants included in the study. The files' confidentiality and anonymity were preserved throughout the whole study process.

Results

A total of 285 cases of Covid-19 have been admitted to the ECT. The mean age was 45 ± 21 years (range: 0-87 years); 161 (56.49%) were male. However, the majority age group was represented by patients of 60 years or beyond (34.04%).

Depending on the type of case, we noted 161 community cases (56.49%), 115 contact cases (40.35%) and nine imported cases (3.2%). These imported cases came from three countries with four from Guinea-Bissau, three from France and two from Gambia. The most common initial symptoms were fever 125 (43.86%), cough 112 (39.30%) and dyspnea 73 (25.61%), polyarthralgia 72 (25.26%) (Table 1 and Table 2). According to the clinical forms, there were 146 (51.2%) patients who presented mild forms, 82 (27.7%) patients presented asymptomatic forms and severe forms were noted in 57 (20%) patients.

Respiratory distress syndrome with hypoxemia (oxygen saturation < 92%) was found in 49 (17.19%) patients. The most common comorbidities were hypertension 62 (21.75%) and diabetes 34 (11.93%). We noted alcohol consumption in 12 patients (4.6%) and active smoking in 15 (5.8%) patients. The epidemiological curve during the study period showed a peak between July and August followed by a flattening of the curve around October 2021 (Figure 1). In 27 patients who have performed a blood count, anemia (Hb < 10 g/l), thrombocytopenia (< 150 g/l) and hyperleukocytosis (> 10 g/l) were found in 22.7%, 17.3% and 36% of cases respectively, while creatinine clearance < 60 ml/min and CRP > 96 mg/l were noted in 62.86% and 58.57% respectively.

The average duration of RT-PCR positivity was 13 ± 04 days [range 4-36 days]. Hydroxychloroquine combined with Azithromycin were administered to 215 (73.12%) patients. Fifty-seven 57 (20%) patients were admitted to intensive care. Among these patients 50 of them received oxygen therapy, 05 cases put on invasive mechanical ventilation and 02 went under hemodialysis. The median age of these patients was 68 years [0-87 years].

The lethality was 7.7% (22 deaths) and one patient was readmitted for relapse.

In bivariate analysis, six (6) factors were significantly associated with the occurrence of covid19-related deaths: Age greater than or equal to 60 years (p: 0.000), diabetes (p: 0.021), severe forms (p: 0.000), renal failure (p: 0.000), stroke (p: 0.000) and hypoxemia (oxygen saturation < 92%) during admission. However, in multivariate analysis after binomial regression, only two factors were significantly associated with the occurrence of death. Those are hypoxemia (< 92%) (OR = 16.28; CI 95% [4.43-59.86]) and the age of 60 and beyond (OR = 4.43; CI 95% [1.12-17.40]) (Table 3).

Discussion

Our study population was comparable to the population of the study realized by Bowale, et al. [10]
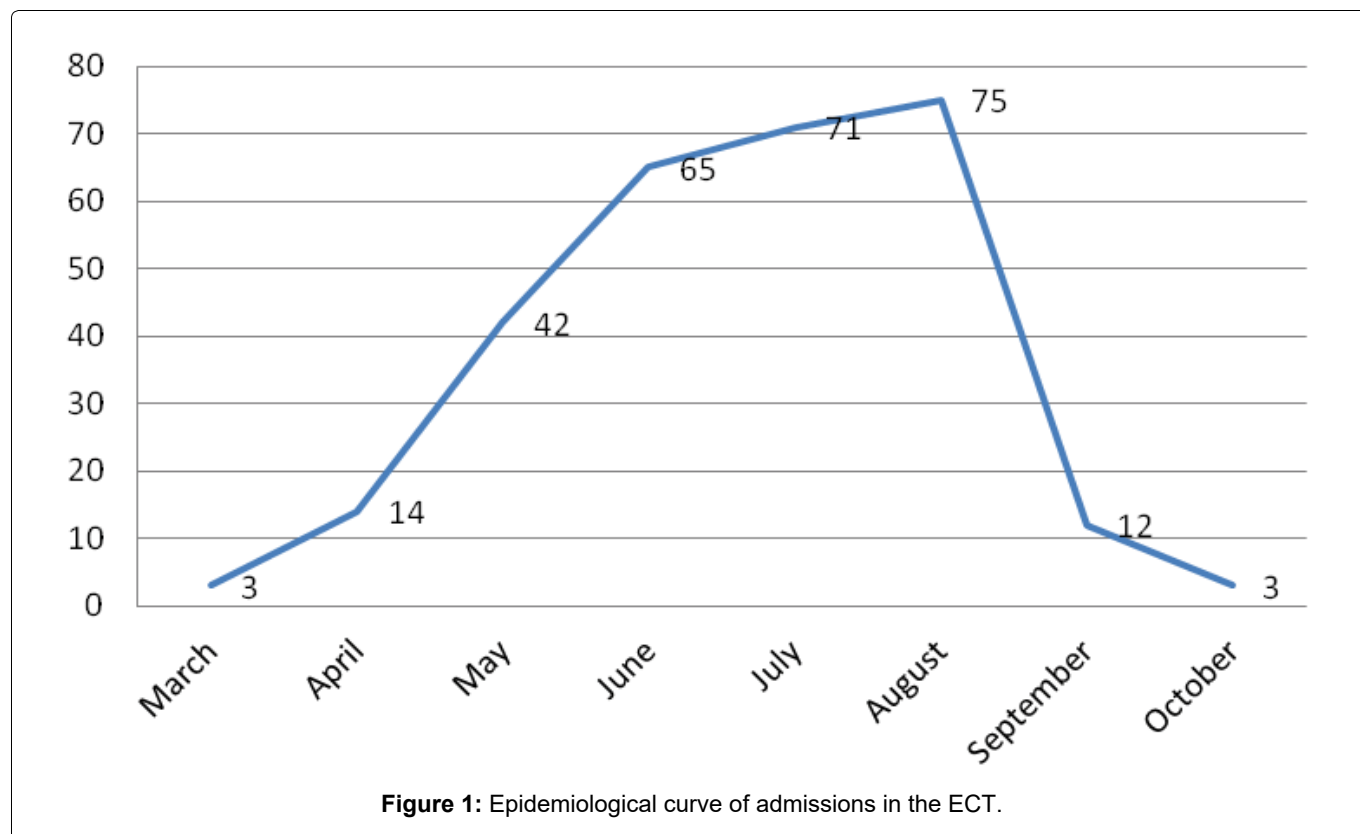
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Figure 1: Epidemiological curve of admissions in the ECT.

Table 3: Multivariate analysis: factors associated with COVID-19 related deaths.

Variables	OR	*p*	IC [95%]
Age ≥ 60	9.01	0.009	[1.75-46.41]
Oxygen saturation < 92%	10.32	0.000	[2.85-37.36]
Hypertension	2.08	0.229	[0.63-6.87]
Diabetes mellitus	1.00	0.989	[0.28-3.54]
Brain stroke	1.12	0.886	[0.22-5.74]
Chronic Kidney disease	2.43	0.117	[0.80-7.40]

in Nigeria with a male predominance and the mean age was 45 ± 21 years [0-87 years]. These demographic aspects were also found in several studies in China [1,3] and in the USA [2]. Hypertension was the most common comorbidity with (21.75%), followed by diabetes (11.93%). That predominance of hypertension and diabetes was also noted in West Africa [11]. This trend was similar to the data reported by the studies of Zhou F, et al. [12] in China and Richardson S, et al. [13] in the USA. The proportion of asymptomatic cases was around 27.77%. This result was close to the result of the study by Hu Z, et al. [14] where 29.2% of the patients were asymptomatic; but greater than the 17.9% of the study carried out on the passengers of the cruise ship Diamond Princess [15] who remained in quarantine on board Yokohama (Japan). But, higher figures (up to 75%) have been reported [5]. The most common symptoms on admission were fever (43.86%), cough (39.30%) and dyspnea (25.61%). These prevalence are comparable to those observed in studies carried out in Nigeria by Bowale, et al. [10] and in China by Wu, et al. Guan, et al. and Zhou, et al. who found as cardinal signs occurring in

the first days of infection: fever over 37.5 °C (88.7-4%), cough (67.8-81.1%), sputum (23-41.3%) and dyspnea (18.7-39.8%) [1-3]. Mean duration of RT-PCR positivity was 13 ± 04 days [range 4-36 days]. These results were comparable to those reported in a Chinese study [16] where this duration of positivity could extend up to 25 days after the onset of the first symptoms and exceeded 20 days in 7/21 of the patients.

Among our 285 cases tested positive for SARS-CoV-2, 22 died, with a lethality rate of 7.71% and the lethality rate was up to 38.6% for the severe forms. Indeed, the lethality rate depends on the diagnostic strategy. It will be lower in the context of a mass screening that identifies both symptomatic and asymptomatic people, while it will be higher in the case of a targeted diagnosis in symptomatic patients who present risk factors for severe forms or presenting hospitalization criteria.

In univariate analysis, unlike hypertension, diabetes, stroke, and renal failure were significantly associated with the occurrence of death, but not in multivariate analysis. Previous studies have shown that pre-existing

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diabetes, chronic cardiovascular or kidney disease can increase the risk of death [17]. Chinese data show that diabetes confers an odds ratio of 2.85 (95% CI: 1.35-6.05) of in-hospital mortality [18]. In the first Chinese studies reporting the rate of diabetic patients in the infected population, diabetes appeared to be 2.26 times (95% CI: 1.47-3.49) more common in patients with a more severe infection compared to those with a less severe infection. It has been suggested that direct SARS-CoV-2 infection and the human immunological response could destabilize pre-existing myocardial and renal disease. Complications, such as acute heart or kidney damage, can therefore occur most often in patients with these underlying comorbidities leading to an increased risk of death.

In multivariate analysis, the age of at least 60 years and hypoxemia (less than 92%) appeared to be strongly associated with mortality. This finding has been made by several studies [3]. Mortality related to COVID-19 increases sharply with age progression, with an increasing and exponential lethality rate from the age of 60 observed in the Italian and Chinese populations [11]. Age is of major importance. Thus, in China, a mortality rate of 0.32% among those under 60, 6.4% among those beyond 60, and 13.4% over the age of 80 has been demonstrated [19,20]. The results of high mortality rates in patients beyond 60 years of age and ventilated patients with ARDS (Acute respiratory distress syndrome) are similar to reports of smaller series of critically ill patients in the United States [11].

Conclusion

The proportion of elderly subjects admitted for Covid-19 in our CTE was significant. They had several comorbidities dominated by hypertension and a significant excess of mortality. Patients admitted with significant oxygen desaturation also had a poor prognosis. The health authorities must focus on prevention measures in this vulnerable population, in order to allow screening and early treatment to reduce the mortality rate.

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