

Profile of Patients Infected with SARS-CoV-2 and Presenting at Least One Comorbidity in the Epidemic Treatment Centers (CTE) of Benin: Epidemiological, Clinical, and **Therapeutic Aspects**

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Abstract

Introduction: 2019 coronavirus disease, also known as COVID-19, is a highly contagious respiratory disease, rapidly expanding, caused by a new human coronavirus (SARS-COV-2). COVID-19, the main public health problem in Benin since March 2020, is marked by its impact on morbidity and mortality, and its significant socio-economic consequences worldwide. When associated with comorbidity, it can be fatal for the patient. The aim of this work is to study the profile of patients infected with the new coronavirus and presenting one or more associated comorbidities in Benin's CTEs. Method: This study was carried out in the three (03) CTEs of Benin. It was a retrospective and descriptive study on patients infected with the new coronavirus and presenting at least one associated comorbidity over 11-month period from August 2020 to June 2021. We carried out a thorough recruitment of all patients who tested positive by PCR and were admitted to these centers, presenting at least one comorbidity and whose records were more or less complete during the study period. Results: Out of 819 hospitalized patients during the study period, 516 patients had at least one comorbidity. The hospital prevalence of COVID cases associated with comorbidities in the care centers was 63%. The

male gender predominated (57.75%), with a sex ratio (M/F) of 1.37. The over-60 age group was the most represented (49.80%). Comorbidities were dominated respectively by arterial hypertension (68.60%), diabetes (40.31%), obesity (11.05%) and chronic renal failure (7.75%). The symptomatology was polymorphous, but respectively dominated by asthenia (57.56%), fever (51.55%), dyspnea (45.93%) and cough (45.16%). Patient treatment was based on two protocols: one using chloroquine and the other using antiretrovirals (ARVs). The progression was favorable for 76.74% of patients. **Conclusion:** It is therefore important to reinforce the means of combating comorbidities, in particular hypertension, diabetes, obesity, HIV and chronic renal failure. A particular attention must be paid to the old individuals.

Keywords

COVID-19, Profile, Comorbidity, CTE, Benin

1. Introduction

COVID-19, the main public health problem in Benin since March 2020, is marked by its impact on morbidity and mortality and its significant socio-economic consequences worldwide. This pandemic is creating job insecurity and food insecurity [1]. According to the World Bank, "The COVID-19 pandemic has plunged the global economy into its worst recession since World War II." [2]. This scourge has highlighted the limits of health systems in the world. For WHO's Africa Director, "The coronavirus pandemic has once again proven the importance of investing in health systems, reinforcing equitable access to care, and improving preparedness for epidemic prevention and control." [3]. According to the WHO, mortality related to COVID-19 was estimated at 4,879,235 deaths worldwide as of October 15, 2021, out of 239,437,517 confirmed cases, i.e., a case fatality rate of 2.038% [4]. In Benin, thanks to the implemented system, human losses have been limited. On this date, Benin reported 161 deaths out of 24,560 confirmed cases [5]. This represents a case fatality rate of 0.656%.

Clinically, the manifestations related to infection with the new Coronavirus (SARS-CoV-2) are highly polymorphous and multi-systemic, extending far beyond the typically respiratory nosological framework [6]. These manifestations can be cardiovascular, dermatological, ENT, hepatic, renal, ophthalmological, and even neurological. The most severe manifestation described is Severe Acute Respiratory Syndrome (SARS), requiring specific management [7]. COVID-19, when associated with comorbidities, can be fatal for the patient. In low-income countries like Benin, many citizens have comorbidities [8] and therefore potentially show severe forms of the disease which can be fatal.

Despite the relative abundance of literature on the coronavirus and on the epidemiological profile of patients infected with SARS-CoV-2 on an international scale, national studies in Benin on this issue remain scarce. Therefore, it seems relevant to carry out research aimed at studying the profile of patients infected with SARS-CoV-2 and presenting at least one associated comorbidity in CTE of Benin.

2. Study Methods

Our study took place in the CTEs of Benin, specifically in the CTEs of Cotonou, Allada, and Parakou.

2.1. Type of Study

This was a descriptive retrospective study on patients infected with SARS-CoV-2 who were admitted to the CTEs from August 1, 2020, to June 30, 2021.

2.2. Study Population

The study population consisted of patients infected with SARS-CoV-2 who were admitted to CTEs with at least one comorbidity during the study period.

2.2.1. Inclusion Criteria

All patients with at least one positive COVID-19 PCR on admission and at least one associated comorbidity whose records were available, were included in the study.

2.2.2. Exclusion Criteria

Patients with very little information in their records were excluded.

2.3. Sampling

This was a non-probabilistic convenience sampling, with exhaustive and systematic census of all medical records of patients meeting our criteria.

2.4. Data Collection

Data collection was conducted through document review, specifically the patients' medical records. A digital data extraction form was created using the KoboCollect app to facilitate data collection via smartphones. Data collection began following the issuing of a research authorization granted by the Minister of Health on August 31, 2021, under number 2634/MS/DC/SGM/DRFMT/SRAO/SA. With the recruited agents, we proceeded to review the records. During the collection process, we systematically checked each completed electronic form daily to minimize information bias.

2.5. Study Variables

The variables examined in this study are as follows:

- **Sociodemographic Variables** (age, gender, occupation, education level, ethnicity, origin, marital status);

- variables relating to clinical parameters (comorbidities, functional signs, general signs, physical signs);

- variables relating to therapeutic data (admission time, length of hospitalization, adherence to the therapeutic protocol, resuscitation materials used, treatment progress).

2.6. Data Processing and Analysis

The completeness and coherence of the collected data were verified daily. Data were processed and analyzed using Stata 15 software. Quantitative variables were expressed as mean with standard deviation when the distribution was normal, and by the median with interquartile range (Q1; Q3) when the distribution was asymmetric (assessed by the Shapiro-Wilk test). Qualitative variables were expressed in headcounts and percentages.

2.7. Ethical Considerations

In accordance with the principle of medical confidentiality, confidentiality was rigorously maintained throughout the survey. The anonymity and confidentiality of patient records were guaranteed through an anonymous identification system of forms. The collected data were used solely for the purpose of this study [9].

3. Results

3.1. Epidemiological Characteristics

3.1.1. Hospital Prevalence of Comorbidities Associated with Patients Infected with SARS-CoV-2 in CTE (August 2020-June 2021)

Out of 819 hospitalized patients during the study period, 516 patients had at least one comorbidity. The hospital prevalence of comorbidities among patients infected with SARS-CoV-2 in CTE over the period of August 2020 to June 2021 was 63%.

3.1.2. Distribution of Patients Infected with SARS-CoV-2 with at Least One Comorbidity in CTE According to Age, Gender, Country of Origin, and Department of Origin (August 2020-June 2021)

The average age of patients was 57.25 ± 15.77 years, with extremes ranging from 5 months to 92 years. The age group of 45 years and over accounted for 81.97%. Males were predominant, with 298 men and 218 women, resulting in a sex ratio (M/F) of 1.37. The majority of patients, 97.87%, resided in Benin. Regarding the department of origin, the littoral department was the most represented. In fact, 168 patients (33.27%) came from this department. This information was not provided for 128 patients, representing 23.17% of the total. Table 1 shows the distribution of patients infected with SARS-CoV-2 with at least one comorbidity in CTE according to age, gender, country of origin, and department of origin.

3.1.3. Distribution of Patients Infected with SARS-CoV-2 with at Least One Comorbidity in CTE According to Marital Status, Occupation, Ethnicity and Level of Education (August 2020-June 2021)

In the vast majority of cases, ethnicity was not reported. There were 359 patients (69.57%) for whom this data was missing. 79 patients (15.31%) were of Fon ethnicity. For 336 patients (65.12%), the marital status was not specified; 145 patients (28.1%) were married. For 345 patients (66.86%), the education level was not reported; 112 patients (1.71%) had a university level. For 156 patients (30.23%), the profession was not specified; 85 patients (16.47%) were civil servants. **Table 2** shows the distribution of patients infected with SARS-CoV-2 with at least one comorbidity in CTE according to marital status, occupation, ethnicity, and education level.

Variables	Headcount	Percentage
Age in years $n = 516$		
< 5 years	4	0.78
[5 - 15 years [3	0.58
[15 - 25 years [12	2.33
[25 - 35 years [20	3.88
[35 - 45 years [54	10.46
[45 - 60 years [166	32.17
\geq 60 years	257	49.80
Gender $n = 516$		
Man	298	57.25
Woman	218	42.25
Country of origin $n = 516$		
Benin	505	97.87
Other*	11	2.13
Department of origin $n = 505$		
Alibori	5	0.99
Atacora	4	0.79
Atlantique	95	18.81
Borgou	33	6.53
Collines	8	1.58
Couffo	5	0.99
Donga	1	0.20
Littoral	168	33.27
Mono	7	1.39
Ouémé	41	8.12
Plateau	1	0.20
Zou	20	3.96
Not reported	117	23.17

Table 1. Distribution of patients infected with SARS-CoV-2 with at least one comorbidity in CTE according to age, gender, country of origin, and department of origin.

*: 04 patients coming from France, 02 from Nigeria, 02 from DRC, 01 from Niger, 01 from Ghana and 01 from Maroc.

Variables	Headcount	Percentage
Marital status		
Single	19	3.68
Divorced	3	0.58
Married	145	28.1
Wodow/widower	5	0.97
Lives in couple	8	1.55
Not reported	336	65.12
Occupation		
Farmer/Craftsman	39	7.56
Merchant/retailer	63	12.21
Student	11	2.13
Civil servant	85	16.47
Health agent	16	3.10
Housewife	8	1.55
Driver	40	7.75
Religious	4	0.78
Retired	65	12.60
Other	29	5.62
Not reported	156	30.23
Ethnicity		
Adja/Mina	28	5.43
Fon	79	15.31
Goun	17	3.29
Nago/Yoruba	22	4.26
Other ethnicity	13	2.52
Not reported	359	69.57
Education level		
Not educated	8	1.55
Primary	18	3.49
Secondary	33	6.40
University graduate	112	21.71
Not reported	345	66.86

Table 2. Distribution of patients infected with SARS-CoV-2 with at least one comorbidity in CTE according to marital status, occupation, ethnicity, and education level (n = 516).

3.2. Clinical Characteristics

3.2.1. Distribution of Patients Infected with SARS-CoV-2 with at Least One Comorbidity in CTE According to Comorbidity (August 2020-June 2021)

Patients admitted to the CTE mostly had associated pathologies, arterial hypertension followed by diabetes and obesity. These comorbidities were respectively found in 68.60%, 40.31%, and 11.05% of the patients. **Table 3** shows the distribution of patients infected with SARS-CoV-2 with at least one comorbidity in CTE according to comorbidity.

 Table 3. Distribution of patients infected with SARS-CoV-2 with at least one comorbidity in CTE according to comorbidity.

Variable	Handcount	Percentage
Comorbidities		
Arterial hypertension	354	68.60
Diabetes	208	40.31
Cardiopathies	31	6.01
Hematological disorders	21	4.07
Respiratory disorders	37	7.17
Psychiatric disorders	2	0.39
Neurological disorders	17	3.29
Liver disorders	12	2.33
Cancers	16	3.10
HIV	16	3.10
Chronic renal failure	40	7.75
Obesity	57	11.05
Others*	12	2.33

*: Among the other comorbidities, we have two (02) cases of severe acute malnutrition, two (02) cases of rheumatoid arthritis, one (01) case of superficial second-degree burns, one (01) case of Down syndrome, one (01) case of tetralogy of Fallot, one (01) case of chronic prostatitis, one (01) case of cranioencephalic trauma from a public road accident, one (01) case of chronic inflammatory bowel disease, one (01) case of hyperthyroidism, and one (01) case of vitiligo.

3.2.2. Distribution of Patients Infected with SARS-CoV-2 with at Least One Comorbidity in the CTE According to the Dominant Functional Symptoms (August 2020-June 2021)

The dominant functional symptoms in the study were respectively: asthenia (57.56%), fever (51.55%), dyspnea (45.93%), cough (45.16%), anorexia (20.35%), rhinorrhea (11.24%), cephalalgia (10.08%), myalgia (8.53%), and anosmia (6.59%).

3.2.3. Distribution of SARS-CoV-2 Infected Patients with at Least One Comorbidity in the CTE According to General Signs on Admission

Only 188 patients (36.43%) were in good general condition on admission; 307 (59.50%) had an admission heart rate >20 cycles per minute; 83 (16.09%) had a temperature >37.8°C; 132 (25.58%) had a heart rate >100 beats per minute and 245 (47.48%) had a pulse oxygen saturation percentage <95%. Table 4 shows the distribution of patients infected with SARS-CoV-2 with at least one comorbidity according to general signs on admission.

Table 4. Distribution of patients infected with SARS-CoV-2 with at least one comorbidity according to general signs on admission (n = 516).

Variable	Handcount	Percentage		
Assessment of gen	Assessment of general condition on admission			
Good	188	36.43		
Poor	181	35.08		
Fair	147	28.49		
Respiratory rate in c	ycles per minute on adm	lission		
<16	3	0.58		
Between 16 and 20	146	28.29		
>20	307	59.50		
Not reported	60	11.63		
Inlet tempera	Inlet temperature in degrees Celsius			
<36.1	20	3.88		
Between 36.1 and 37.8	387	75.00		
>37.8	83	16.09		
Not reported	26	5.04		
Heart rate	Heart rate in beats per minute			
<50	3	0.58		
Between 50 and 100	369	71.51		
>100	132	25.58		
Thready pulse	1	0.19		
Not reported	11	2.13		
Pulse oxygen saturation in percent				
<95%	245	47.48		
≥ 95%	260	50.39		
Impenetrable saturation	1	0.19		
Not reported	10	1.94		

3.3. Therapeutic Parameters

3.3.1. Distribution of Patients Infected with SARS-CoV-2 with at Least One Comorbidity in the CTE According to Admission Period of Time and Length of Hospitalization (August 2020-June 2021)

The average admission time was 6.17 days, with extremes ranging from around one (01) hour to 60 days.

The average length of hospitalization was 11.06 days, with extremes ranging from 30 minutes to 70 days. **Table 5** shows the distribution of patients infected with SARS-CoV-2 with at least one comorbidity in the CTE according to admission time and length of hospitalization.

Table 5. Distribution of patients infected with SARS-CoV-2 with at least one comorbidity in the CTE according to admission time and length of hospitalization (n = 516).

Variables	Handcount	Percentage
Admission time (in days) $n = 507$		
≤6	308	60.75
>6	199	39.25
Length of hospitalization (in days) $n = 516$		
<7	85	16.47
[7 - 14]	331	64.15
>14	100	19.38

3.3.2. Resuscitation Materials Used

In the CTE, 270 patients (52.33%) were on oxygen therapy by mask or scope, 15 (2.91%) had endotracheal intubation, 38 (7.36%) were on non-invasive ventilation and 208 had not used any resuscitation equipment. **Table 6** shows the distribution of patients infected with SARS-CoV-2 with at least one comorbidity according to resuscitation materials used.

3.3.3. Therapeutic Care of Patients Infected with SARS-CoV-2 and Presenting at Least One Comorbidity on Admission to CTE (August 2020-June 2021)

The therapeutic care of patients infected with SARS-CoV-2 on admission to the CTE was based on protocol 1 (using chloroquine) for simple and moderate cases, on protocol 2 (using antiretrovirals) for severe cases, and on a mixed protocol. More than half of the patients, or 58.53% (302), were treated using protocol 2, 39.15% using protocol 1 only, and 2.32% with both protocols. Details of the different protocols used in Benin are in the Appendix.

3.3.4. Therapeutic Outcome for Patients Infected with SARS-CoV-2 and Presenting at Least One Comorbidity on Admission to the CTE (August 2020-June 2021)

The healing rate in the CTE was 76.74%.

Variables	Handcount	Percentage
Oxygen therapy with mask or goggles		
Yes	270	52.33
No	246	47.67
Endotracheal intubation		
Yes	15	2.91
No	501	97.09
Non-invasive ventilation		
Yes	38	7.36
No	478	92.64
No resuscitation equipment used		
Oui	208	40.31
Non	308	59.69

Table 6. Distribution of patients infected with SARS-CoV-2 with at least one comorbidity according to resuscitation materials used (n = 516).

4. Discussion

4.1. Reaching Study Objectives

The objective of this study was to examine the profile of patients infected with SARS-CoV-2 and presenting at least one associated comorbidity in CTE in Benin. At the end of this study, we can retain that the combination of various techniques and tools used in data collection enabled us to achieve this objective.

4.2. Quality and Validity of Results

The study was conducted as a retrospective approach. The methodology adopted was in line with the intended objective. However, a potential risk of information bias could remain in the patients' records, as the data were collected from their medical files. The collection of these data was carried out by trained and supervised investigators on the use of the tools, ensuring a better understanding of the latter and helping to reduce bias.

4.3. Difficulties and Limits of the Study

The difficulties encountered during this study are related to the absence of some data in the patients' records.

Two factors could account for the missing data, especially socio-demographic data in ETCs:

1) Excessive workload and time constraints: In the context of a pandemic such as COVID-19, treatment centers were often overwhelmed by the number of patients they had to care for. This meant that healthcare professionals had to juggle clinical care and record-keeping, which may have led to errors or omissions when records were filled in manually. Lack of time could have led staff to overlook details or postpone updating information, increasing the risk of incomplete data.

2) Fatigue and burnout: Working conditions during the pandemic were often marked by high stress and general exhaustion among healthcare staff. When files have to be filled in by hand, this demands continuous attention and concentration, which can be difficult to maintain for professionals already exhausted by workload and long hours.

4.4. Comparison of Results with Those of Other Studies

4.4.1. Epidemiological Aspect

1) Hospital prevalence

The hospital prevalence of COVID-19 cases associated with at least one comorbidity was 63%. Indeed, out of 819 hospitalized patients during the study period, 516 patients had at least one comorbidity from August 2020 to June 2021. We have no comparative study in Benin.

In Africa, there is a considerable variability, with prevalences ranging from 33.6% to 77%. In studies conducted by *Calys-Tagoe and others* in Ghana, *Ahmed Kadi and others* in Algeria, *Donamou and others* in Guinea Conakry, these prevalences were respectively 33.6%, 56%, and 77% [10]-[12]. This variability in results may be explained, on one hand, by the varying admission criteria at these care centers, and on the other hand, by factors related to lifestyle and age. In fact, the average age of patients was 41 years in the study by *Calys-Tagoe and others* [10], 54 years with *Ahmed Kadi and others* [11], 57.25 years with our study and finally 59 years with *Donamou and others* [12]. Age was proportional to the hospital prevalence of comorbidities among infected patients.

2) Age

The average age of patients admitted during the study period was 57.25 years. Compared to other studies, our results were similar to those of *Donamou and others* in Guinea Conakry (59 years) [12]. They were slightly higher than those of *Ahmed and others* in Algeria (54 years) [11], the ones of *Savadogo Mamoudou and others* (53 years) [13] but lower than those of *Louhaichi and others* (61 years) in Tunisia [14] and *Piva and others* in Italy (64 years) [15]. Overall, older people were by far the most vulnerable to COVID-19. Results from an analysis conducted by EPI-PHARE in the general population showed that the risks of being hospitalized and dying due to this virus increase exponentially with age [16].

3) Gender

The study population was dominated by male subjects (57.92%) with a sex ratio (M/F) of 1.38. According to studies in Africa, this male predominance varied between 54% and 79%. As a matter of fact, *Calys-Tagoe and others* in Ghana [10], *Savadogo Mamoudou and others* in Burkina Faso [13], *Ahmed Kadi and others* in Algeria [11], *Nkodia and others* in the Republic of Congo [17], *Joseph Donamou and others* in Guinea Conakry [12], respectively reported a male predominance of 54%, 55.5%, 58.5%, 71.60% et 79%. In Canada according to a study by *Mitra and others,* this rate was 67.5% [18]. Men might therefore be more exposed to severe forms of the disease [18]. This male predominance may reflect differences in social and cultural activities between both genders. Men are generally the financial providers for families, which drives them to work. Being more mobile and generally in contact with a larger number of people than women, they may face a higher risk of contamination [19].

4) Department of origin

In the CTE, the study population primarily came from the southern departments of the country. In fact, patients from these departments represented 62.78% of hospitalized cases. This rate is particularly significant considering that the department of origin was not reported for 23.17% of patients. The other departments, particularly those in the north and center, accounted for only 14.05% of patients.

The city of Cotonou was the most represented. Indeed, Cotonou, the economic capital of the country, is the city that hosts most of the administrative and political structures. Additionally, the presence of some key infrastructures (such as the international airport, Dantokpa market, and the Autonomous Port of Cotonou) facilitates human interaction, which is a significant catalyst for the infection. Data INSAE in 2017, put Cotonou as the most populated city of the country, though it is far from being the largest in terms of surface, which creates high population density [20]. The heavy influx of people from neighboring departments for economic and administrative activities also contributes to this density.

4.4.2. Clinical Aspect

1) Comorbidities

The main comorbidities found were, in the order, arterial hypertension, diabetes, and obesity. Indeed, 68.34% of patients admitted to the CTE were at least hypertensive, 40.31% were at least diabetic, and 10.81% were at least obese. *Donamou and others* in Guinea Conakry reported similar results [12]. For *Ahmed Kadi and others* in Algeria, the two dominant comorbidities were arterial hypertension (45.94%) and diabetes (37.83%) [11]. For *Kefti and others* still in Algeria, the dominant comorbidity was arterial hypertension [21]. In *Mitra and others*' study in Canada the most common comorbidities were hypertension (46.2%) and diabetes (30.8%) [18]. For *Piva and others* in Italy [15], the most frequently found comorbidities were hypertension (45%) followed by diabetes (31%).

2) Functional symptoms

The functional symptoms were dominated by "Asthenia-Fever-Dyspnea-Cough". These symptoms were respectively found in 57.56%, 51.55%, 45.93%, and 45.16% of patients. *Salvadogo Mamoudou and others* in Burkina Faso found exactly the same symptoms but with different proportions. In fact, fever, cough, dyspnea and asthenia were found in 86%, 69%, 60%, and 29% of cases, respectively [13]. *Louhachi and others* also found the quartet of fever (55%), cough (85%), dyspnea (85%) and asthenia (70%) [14]. For Kefti and others in Algeria, the combination of asthenia-Fever-Cough was found in 70% of cases [21]. For Donamou and others the most frequent clinical symptoms were dyspnea, asthenia and cough in 81%, 64% and 60% respectively [12]. For Ahmed Kadi and others, the most frequent clinical symptoms were dry cough (70.76%), fever (70.76%), asthenia (29.23%), dyspnea (26.15%) and diarrhea (26.15%) [11]. The functional symptoms of COVID-19 among patients admitted to the CTE were similar to other studies, notably with a preferential attack on the respiratory system (especially with cough and dyspnea).

4.4.3. Therapeutic Aspect

1) Admission time

The average admission time was 6.17 days. It was less than 7 days for 308 patients, i.e. 60.75% of all patients. The maximum admission time was 60 days. This average was lower compared to studies conducted in Africa. Indeed, in the study by *Sabrine Louhachi and others* in Tunisia, the average admission time was 8 days [14]; it was 10 days in the study by *Kefti and others* in Algeria [21], 11 days in the study by *Ahmed Kadi and others* in Algeria [11], and finally 12.43 days by *Donamou and others* in Guinea-Conakry [12].

This relatively short period could be explained by:

- the systematic screening of all patients admitted to the emergency departments of the country's public reference centers, facilitated by the government's policy of setting up 13 new laboratories, enabling easier screening for COVID-19 in order to refer;

- the implementation of a call center service, not only for information on COVID-19 but also to report a suspected case;

- the implementation of mobile teams to conduct home assessments of symptomatic patients;

- the aggressive sensitization campaign launched by the government;

- the training of health workers on the pathology and the importance of knowing how to refer to CTE.

2) Discussion on patient therapeutic outcome

The therapeutic success rate in (CTE) during the study period was 76.74%. Our results were similar to those of *Grasselli and others* [22] (Lombardy), who found a resuscitation success rate of 74%, and higher than those of *Bhatraju and others* [23] and *Xiaobo Yang and others* [24], who found 50% and 38.5%, respectively. This high therapeutic success rate observed in our study is practically the same as those found in other sub-Saharan African countries [25]. Indeed, several hypotheses can be raised to explain this low mortality rate, including the following:

- The precocious use of anticoagulants and corticosteroid in particular (highdose dexamethasone) during the first weeks of the pandemic, even before the WHO declared that the use of dexamethasone reduced mortality in patients infected with SARS-CoV-2;

- The average age of our study population was lower compared to those found

in American and European studies [26] [27]. In fact, an age above 60 years appeared to be strongly associated with mortality [28].

5. Conclusion

Patients infected with SARS-CoV-2 and presenting at least one comorbidity accounted for 63% of those admitted to treatment centers. Comorbidities were dominated respectively by arterial hypertension (68.60%), diabetes (40.31%), obesity (11.05%) and renal failure (7.75%). Patients admitted to these centers with at least one comorbidity were primarily individuals over the age of 60 (with an average age of 57.25 \pm 15.77 years), residing in the southern part of the country. A male predominance with a sex ratio (M/F) of 1.37 was observed. The symptomatology was polymorphous, but dominated by asthenia (57.56%), fever (51.55%), dyspnea (45.93%) and cough (45.16%). This showed a preferential attack on the respiratory system. Simultaneously, it is convenient to actively promote vaccination, which remains an essential tool in the fight against severe forms of the disease. A special attention should be given to the elderly, who are more vulnerable. Furthermore, the completeness of medical records must be made a fundamental priority to ensure a better quality care.

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Conflicts of Interest

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

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Appendix: Proposed Treatment Protocols in Benin

Benin has adopted two therapeutic protocols.

- A protocol based on the "Chloroquine-azithromycin" combination (Protocol 1) has been adopted, as in many countries around the world, for the management of non-severe cases (simple and moderate cases).

- A protocol based on lopinavir and Ribavirin (Protocol 2) for severe cases. These molecules inhibit viral RNA synthesis.

1) Treatment protocols proposed in Benin for non-severe cases (Protocol 1)

> ADULTS

• Chloroquine phosphate 250 mg tablet: 01 cp every 08 h for 10 days

+

• Azithromicyne 250 mg: 01 cp every 12 hours (7 a.m. and 7 p.m.) on D1 and 01 cp per day from D2 to D5

• Adjuvant treatments:

- ACE selenium zinc: 01 CP/day;

- Vitamin D: 4000 IU/day or 10 drops to be diluted in water, porridge or fruit juice.

• Anxiolytic and antidepressant:

- Hydroxyzine 25 - 100 mg/d in 02 doses if anxiety disorders;

- Fluvoxamine 50 - 300 mg or Fluoxetine (Prozac) 20 mg/d for major depressive episodes;

- Promethazine 25 - 50 mg for proven insomnia.

➤ CHILDREN

• Chloroquine phosphate 250 mg tablet: 5mg/kg weight every 8 h for 10 days +

• Azithromycin 250 mg: 15 mg/kg every 12 hours (7 a.m. and 7 p.m.) on D1 and 7.5 mg/kg at fixed times from D2 to D5

• Adjuvant treatments:

- Vit C 1g: 250 mg/d for 10 days (Under 7 years);

500 mg/d for 10 days (over 7 years).

- Zinc: 10 mg/d for 10 days (under 6 years);

20 mg/d for 10 days (over 6 years).

- Vitamin D: 1200 IU/day or 3 drops diluted in water, porridge or fruit juice.

2) Therapeutic protocols proposed in Benin for severe cases (Protocol 2)

• Lopinavir/ritonavir 200 mg/50 mg tablet: 400 mg/100mg every 12h for 14 days

• Ribavirin 100 mg injectable/tablet: 400 mg every 12h for 14 days

• Dexamethasone 4mg injectable:

- 16mg/day in 2 doses from D1 to D5 then 8mg/day from D6 to D10 and 8mg/day if longer than D10.

• Enoxaparin Injection or Unfractionated Heparin/Calciparin: In preventive or curative doses, depending on thromboembolic risk

• Antibiotic cover therapy:

- 1st intention: Amoxicillin-clavulanic acid 1 g every 8 h;

- 2nd intention: Cetriaxone or cefotaxime 2 g direct intravenous injection once daily;

- 3rd intention: Ceftrixone/Cefotaxime 2g + Gentamicin 5 mg/Kg (3 to 5 days).

NB: Imipenem 1g/8h + vancomycin 1g 1h microinfusion then 2g IVSE for 24h in case of documented resistance.

- Anxiolytic and antidepressant:
- Hydroxyzine 50 100 mg/day in 02 doses;
- Fluvoxamine 50 300 mg or Fluoxetine (Prozac) 20 mg/day in case of major depressive episodes;
 - Promethazine 25 50 mg if proven insomnia.
 - Adjuvant treatments:
 - Omeprazole 40 mg/day;
 - Albendazole 400 mg to be repeated after 15 days;
 - Intake of potassium and calcium under control of blood ionograms;
 - ACE selenium zinc: 01 tablet/day;
 - Vitamin D: 4000 IU/day or 10 drops diluted in water, porridge or fruit juice.