

COVID-19, a Real Internal Medicine Pathology Due to Its Semiological Richness: Experience of the Niamey General Reference Hospital in Niger

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Abstract

Introduction: COVID-19 is a viral, inflammatory disease with a rich semiological spectrum, making it a true systemic disease, hence the important role that internists can play in its management, especially in developing countries. We conducted a study to investigate the different extra-respiratory signs of COVID-19 in patients admitted to the Niamey General Reference Hospital (HGR). **Methodology:** This was a retrospective study during the first two waves of the epidemic in Niger. All patients diagnosed with COVID-19 by PCR and hospitalized at the General Reference Hospital (HGR) in Niamey were included. Extrapulmonary and paraclinical clinical signs were studied. **Results:** We recorded 205 patients hospitalized for COVID-19: 145 men (70.73%) and 60 women (29.27%). The mean age was 55.76 years [range: 12-103]. In total, 81 patients had at least one comorbidity (39.51%), of which the most frequent comorbidity was high blood pressure with 45 cases (21.95%), followed by diabetes (35 cases, 17.05%) and asthma (6 cases, 2.92%). The most frequent general sign was fever (n = 130; 63%), followed by asthenia (n = 73; 36%), and the extra respiratory functional signs were vomiting (7%), diarrhea (5%) and headache. For physical signs, neuropsychiatric disorders were the most frequent: 17 cases of consciousness disorder (8%), 11 cases of behavioral disorder (5%), 8 cases of temporospatial disorientation (4%), and 1 case of motor deficits. For cardiovascular signs, we found: 1 case of right heart failure secondary to pulmonary embolism and 1 case of sural venous thrombosis. In the biological assessment, the erythrocyte sedimentation rate (ESR) was elevated in 9 patients (82%), and the CRP elevated in 67 (74%), with 41 (45%)

who had a CRP greater than or equal to 60 mg/L. There was hyperleukocytosis (especially neutrophilic), anemia, increased troponin levels, increase in AST, ALT and D-Dimer, creatinine and azotemia disturbances. **Conclusion:** The extra-respiratory semiology of COVID-19 is very rich, making it a systemic pathology requiring holistic management, hence the important role of the internist.

Keywords

COVID-19, Systemic Disease, Internal Medicine, Niger

1. Introduction

COVID-19 is an emerging infectious disease with respiratory manifestation caused by a strain of coronavirus called SARS-COVID-2. It is one of the most significant pandemics in world history, affecting the global economy. As of April 27, 2025, the number of people infected with the COVID-19 coronavirus worldwide is 704,753,890, with 7,010,681 deaths. In Niger, there are 9931 diagnosed cases with 312 deaths [1]. Since its discovery, numerous studies have been conducted to understand its origin, virological characteristics, clinical manifestations and therapeutic prospects [2]-[7]. The virus has a respiratory tropism whose pulmonary manifestations constitute the main signs of the disease, responsible for acute respiratory distress syndrome (ARDS). To date, it has been demonstrated that COVID-19 is a general inflammatory disease with a cytokine storm. Several studies have shown this inflammatory mechanism with the involvement of several organs and systems [7]-[9].

In a meta-analysis (22 publications), it was reported that gastrointestinal symptoms occurred in about 3% - 40.7% of patients, including nausea, diarrhea, anorexia, vomiting, abdominal pain, belching, and abdominal distension [10]. In Niger, Ounteini A *et al.* report in a hospital series 12.5% of extra-respiratory signs [11].

In Niger context, where organ specialists are in short supply, the internist is an answer to this multitude of manifestations of COVID-19, which requires holistic management.

2. Patients and Methods

This is a retrospective study aimed at investigating the various clinical, paraclinical and extra-respiratory signs of COVID-19 in patients admitted to the General Reference Hospital (HGR) in Niamey. It concerns the first two waves of the epidemic in Niger, from March 2020 to July 2020 and from November 2020 to May 2021, respectively.

Included were patients hospitalized in the COVID-19 care units at HGR with a positive PCR test.

For the purposes of our study, we used a pre-established data collection form. These forms were completed from the patient's medical records and nursing records.

The variables studied were:

- **Socio-demographic:** Age, sex, comorbidities and history.
- **Clinical:** reason for admission, time to admission, general signs, functional and extra-respiratory physical signs, severity, length of hospitalization.
- **Paraclinical:** biological assessments.

The severity of the disease was assessed according to WHO classification [12].

The data were processed using EPI INFO software version 7.2.4.0, entered and processed with Word 2013 and Excel 2013 software. Anonymity and confidentiality were respected on all survey forms and presentation of results.

3. Results

3.1. Epidemiological Aspects

During the period from the first to the second wave of the COVID-19 epidemic (March to August 2020 and October to March 2021, respectively), the HGR recorded 205 cases of patients hospitalized for COVID-19. Among these patients, there were 145 men (70.73%) and 60 women (29.27%). The average age of the patients was 55.76 years, with an extreme of 12 and 103 years. According to the WHO classification, the disease was severe in 85 patients and moderate in 120 patients, with 60 deaths, representing a hospital fatality rate of 26.29%.

In total, 81 patients presented at least one comorbidity (39.51%), of which the most frequent comorbidity was high blood pressure (HBP) with 45 cases (21.95%), followed successively by diabetes with 35 cases (17.05%) and asthma (6 cases, 2.92%).

The duration of hospitalization varied from 1 to 25 days, with an average of 7 days. The average time to onset of symptoms was 6 days before hospitalization, with a minimum of 24 hours and a maximum of 21 days.

3.2. Clinical Aspects

- **General signs**

The most common general sign was fever ($n = 130$; 63%), followed by asthenia ($n = 73$; 36%). Among the patients in whom fever was found, 34 had a fever at home, 74 had a temperature below 38.5°C and 22 had a temperature above or equal to 38.5° (Table 1).

Table 1. Distribution of patients according to the general signs found.

General Signs	Number of Cases	Percentage %
Fever	130	63
Asthenia	73	36
Anorexia	8	4

Regarding oxygen saturation on admission, 70 (58%) had saturations below

90%, 15 (12%) had saturations between 90% - 95% and 36 (30%) had normal saturations (**Table 2**). With regard to blood pressure on admission, 45 patients (35%) had hypertension, and 1 patient had hypotension. Of the hypertensive patients, 31 (69%) were men and 14 (31%) women. Of these men, 23 (74%) were aged between 50 and 90, and of the women, 10 (71%) were aged between 50 and 90 (**Table 2**).

Table 2. Distribution of patients according to oxygen saturation and blood pressure on admission

Oxygen Saturation	Number	Percentage
Less than 90%	70	58
90% - 95%	15	12
Normal	36	30
Total	121	100.00
Blood Pressure	Number	Percentage
Hypertension	45	35
Hypotension	1	1
Normotension	81	64
Total	127	100

- **Extra-respiratory functional signs**

The most common was vomiting in 7% of cases, followed by diarrhea in 5% (**Table 3**).

Table 3. Distribution of patients according to the digestive functional signs found.

Digestive Symptoms	Number of Cases	Percentage %
Vomiting	14	7
Diarrhea	11	5
Nausea	3	1
None	177	87
TOTAL	205	100

Headaches were the most frequent neurological functional signs at 17% (n = 34), followed by anosmia and ageusia, respectively, at 1% each.

- **Extra respiratory physical signs**

- **Cardiovascular signs**

- Vascular examination revealed one (1) case of hepato-jugular reflux, consistent with right heart failure due to acute pulmonary heart disease secondary to pulmonary embolism. There was also one case (1) of unilateral swelling of the leg, corresponding to sural thrombophlebitis.

- **Digestive signs**

- Hepatomegaly was found in 2 patients. Ascites were found in only one

patient. All these cases were associated with right heart failure, one of which was secondary to pulmonary embolism.

- **Neuropsychiatric examination:** neuropsychiatric signs were predominant in our series:
 - **Disturbance of consciousness**
Among the registered patients, 17 patients or 8%, had experienced a disturbance of consciousness.
 - **Behavioral disorders**
There were 11 cases of behavioral disorders, representing 5% of all patients. Agitation was the most common behavioral disorder (7 cases, representing 64%).
 - **Disorientation**
Among the patients, 8 were disoriented (4%).

3.3. Paraclinical Aspects

- **Complete blood count (CBC)**

Of 135 patients who underwent a complete blood count (CBC), 96 had an abnormal CBC. Leukocytosis was the most common abnormality in 32%, followed by anemia, then thrombocytosis, thrombocytopenia, leukopenia, and polycythemia (**Table 4**).

Table 4. Distribution according to CBC results.

Anomalies	Number	Percentage
Hyperleukocytosis	43	32
Anemia	15	11
Thrombocytosis	14	10
Thrombocytopenia	9	7
Leukopenia	8	6
Polycythemia	7	5
Normal	39	29

Neutrophil predominance was frequently found in cases of hyperleukocytosis. Regarding anemia, 11 patients had normocytic normochromic anemia, and 5 had microcytic anemia.

- **Erythrocyte Sedimentation Rate (ESR) and C-Reactive Protein (CRP)**

ESR was performed in 11 of the 205 patients, and 9 (82%) had an abnormal ESR, including 6 (67%) above 61 mm at the 1st hour (**Table 6**). CRP was performed in 91 patients, and abnormal results were found in 67 (74%). Thus, 41 (45%) of patients had a CRP greater than or equal to 60 mg/l (**Table 5**).

- **Glycemia**

A total of 129 patients underwent blood glucose monitoring, of which 77 (60%) had normal blood glucose, 51 (39%) had hyperglycemia and only 1 case of hypo-

glycemia was found.

- **Azotemia and creatinine**

In 143 patients in whom azotemia was performed, 95 (66%) had normal azotemia, and 48 (34%) had hyperazotemia. For creatinine (n = 148), 104 (70%) had normal creatinine versus 44 (31%) who had hypercreatinine. Among patients with hypercreatinine, 40 (30%) had acute renal failure.

- **Blood ionogram**

Hyponatremia was the most common abnormality observed in 27 patients, or 30%, followed by hypokalemia and hypochloremia in 23% and 21%, respectively (**Table 6**).

Table 5. Distribution of patients according to ESR and CRP results.

VS (mm)	Number	Percentage
≥ 61	6	55
Normal	2	18
40 - 60	1	9
20 - 40	1	9
10 - 20	1	9
CRP (mg/l)	Number	Percentage
≥60	41	45
31 - 60	12	13
6 - 15	10	11
15 - 30	4	5
Less than 6	24	26

Table 6. Distribution of patients according to blood ionogram results.

Blood Ionogram	Number	Percentage
Hyponatremia	27	30
Hypokalemia	22	23
Hypochloremia	19	21
Hypernatremia	10	11
Hyperchloremia	7	8
Hyperkalemia	6	7

- **Troponin**

Troponin was measured in 42 patients, and 34 had normal troponin, while 8 (19%) had elevated troponin.

- **Transaminases**

There were 16 patients who had undergone ASAT testing, including 10 patients

with normal ASAT levels and 6 with elevated ASAT levels. For ALAT levels, 16 patients had undergone testing and were normal in 10 patients and elevated in 6 patients.

- **Prothrombin Time (PT)/Activated Partial Thromboplastin Time (APTT)**

Regarding the PT, 37 patients had benefited from the dosage, 31 had a normal TP, 4 (11%) had a decreased level, and 2 had an increased prothrombin level. The APTT was performed in 27 patients, 22 of whom were normal, 2 cases where it was reduced and 3 cases (11%) where it was prolonged.

- **D-dimers**

Of a total of 205 patients registered, D-dimer assay was performed in 32 patients, with 9 having normal values, and 23 (72%) having elevated D-dimer values (**Table 7**).

Table 7. Distribution of patients according to D-dimer results.

Value in µg/ml	Number	Percentage
<500	9	28
≥500	23	72
Total	32	100

4. Discussion and Comments

The retrospective aspect is a limitation for our results due to the absence of certain data for an exhaustive analysis. This is a preliminary study to assess the extra-respiratory signs of COVID-19.

COVID-19 is a truly systemic disease in terms of its pathophysiology. In addition to respiratory damage, several organs may be affected, and the often-associated comorbidities complicate the clinical picture and prognosis [13]. In itself, COVID-19 is a “poly pathology”; hence, the internist has an important role in its management.

The aim of this study is to share the experience of Niger, a developing country where the number of specialist doctors is insufficient to cover the country’s needs. To make up for this shortfall, Niger has turned to internists, who have the capacity to manage patients holistically.

Indeed, during the first two waves of the pandemic in Niger, internists played an important role in the response to COVID-19, ranging from protocols to care in hospitals, particularly at the General Reference Hospital, to outpatient follow-up with mobile teams. Hospitalized patients who showed clinical improvement without severity criteria were followed as outpatients by a mobile team supervised by internists associated with pulmonologists and infectious disease specialists.

During this period, 205 patients were registered at the Niamey General Reference Hospital. Among these patients, there was a male predominance with an M/F sex ratio of 2.41. This male predominance is reported in the epidemiology of this pathology [2] [4] [14]. The median age of our patients was 55.76, which is de-

scribed by authors such as Chen [14], and Dhama K [9], who reported the same median age (55.59).

HBP and diabetes were the most frequent comorbidities, 21.95% and 17.05% respectively, also described by several studies [15]. Higher expression of ACE receptors on the surface of target cells has been shown in patients with these two comorbidities, making them more vulnerable to SARS-CoV-2 with severe presentations [13].

Regarding the time between the onset of symptoms and hospitalization, the average duration was 6 days, with a minimum of 24 hours and a maximum of 21 days. Prolonged delays before consultation and treatment are among the causes of aggravation, enriching both pulmonary and extrapulmonary clinical pictures.

Beyond a viral infection, COVID-19 is a true “systemic disease”, which explains the diversity of extra-pulmonary signs. In our patients, the most frequent general signs were, in decreasing order: fever, asthenia, headaches and myalgia. This is identical to the results of Chen *et al.* but also to those of Tabata *et al.* in 2020 [5] [14]. Fever is initially associated with the infectious syndrome at the beginning of infection and secondarily with the cytokine storm around the 8th day [8] [13]. According to Kefti A *et al.*, in Algeria, clinical complaints were dominated by the triad “asthenia-fever-cough” in more than 70% of cases [3].

The most common extra-pulmonary functional signs found in our patients were vomiting (7%), diarrhea (5%) as reported by Chen *et al.* at the beginning of the pandemic in Wuhan, China, who had already reported these two digestive signs in 2 and 1% respectively [13]. In a study of COVID-19 conducted by Ounteini A in Niger, extra-pulmonary signs accounted for 12.4% of all symptoms. These were: Diarrhea (3.9%); Headache (2.3%); Abdominal pain (2.3%); Nausea (1.3%); Vomiting (1.3%) and Myalgia (1.3%) [11].

Many other studies on COVID-19 report these signs when respiratory signs are excluded [1] [3] [4] [13]. SARS-CoV-2 has been found in the stools of patients infected with the virus [16] [17]. Furthermore, it should be noted that the various therapies used to treat patients can promote digestive disorders, especially diarrhea.

We were interested and especially surprised to find a predominance of neuropsychiatric signs in our series, such as: disorders of consciousness, behavioral disorders, and temporo-spatial disorientation. A review has identified several subgroups of subjects more at risk of mental disorders in the context of the COVID-19 pandemic: those bereaved by COVID-19, adolescents, students, people affected by the virus and finally, health personnel [18]. In our context, these were patients suffering from COVID-19. In a Canadian study during the epidemic, the proportions of people suffering from generalized anxiety and depression increased by 12% and 29% [18]. COVID-19 encephalopathy in severe forms, direct or indirect damage to the brain by the virus, metabolic mechanisms (toxic or metabolic disorders, prolonged sedation and intubation), diffuse infectious and/or inflammatory states are the various mechanisms reported [13] [17] [18].

Taking into account the saturation values, 34.15% of patients were admitted in the context of severe COVID-19, as reported by Zheng *et al.* [16]. Delays in the consultation are probably responsible for these severe cases because of silent hypoxemia, which is not detected early to allow appropriate oxygen therapy [13] [19]-[21]. It is currently accepted that the hypoxemia, which progresses quietly without the patient clinically feeling the dyspnea, is aggravated at home, and the patient is hospitalized in a context of desaturation that darkens the prognosis [13] [19]-[21].

Leukocytosis is the most common abnormality in blood counts; it is predominantly neutrophilic in 50 patients. It is possible that this neutrophilic leukocytosis is due to superinfections in these patients who arrive late at the hospital. CRP and ESR were elevated in the majority of patients in whom these tests were performed. This corroborates the data in the literature, COVID-19 being an inflammatory disease [13] [22], and moderate to intense systemic inflammation is described with cytokine storm [23]. We did not find lymphopenia in our patients; which is contrary to the studies carried out by Chen *et al.*, Tabata *et al.*, Lui *et al.* [4] [5] [14]. This lymphopenia described in the pathophysiology of COVID-19 is called lymphocyte exhaustion [13]. We found three (3) types of anemia profiles. These are normochromic normocytic anemia, which is the most frequent profile, normochromic microcytic anemia, and hypochromic microcytic anemia. Anemia during SARS-CoV-2 infection can be caused by: infection of erythrocyte precursors, damage to mature erythrocytes, cytokine-generated autoimmune hemolysis and inflammation [24]-[27].

Although the majority of patients had normal prothrombin time (PT) and Activated Partial Thromboplastin Time (APTT) levels, we found disturbance of TP and APTT in some patients, which suggests the presence of coagulopathy. Thrombocytopenia and elevation of D-dimer were also common in our patients, as reported in the studies of Chen and Massi [8] [14]. This coagulopathy results, on the one hand, from the intensity of inflammation to generate pro-inflammatory mediators and, on the other hand, from the role of infection of endothelial cells. In the first case, the mediator of inflammation, such as IL-6 or elements of the immune response, such as complement factors, elements of the neutrophil extracellular trap or NET, contribute, among others, to the activation of coagulation factors. In the second case, the endothelial cell is permissive to the SARS-CoV-2 virus and consequently causes a cellular lesion that compromises the anti-thrombogenic barrier of the endothelium. This results in the activation of coagulation. This mechanism of thrombosis during inflammation gives rise to the concept of “thrombo-inflammation or immuno-thrombosis” [28] [29]. This pathophysiology is the basis of coagulation disorders in COVID-19, with consequences such as peripheral venous thrombosis, pulmonary embolism, and also arterial thrombosis. We found two patients, one with acute heart failure secondary to pulmonary embolism and the other with sural thrombosis. COVID-19 can be considered as a thrombogenic pathology, and the benefit of using anticoagulants in patients suf-

fering from moderate to severe COVID is now recognized in the majority of therapeutic protocols.

Troponin was elevated in 8 of our patients, transaminases (AST and ALT) in 6 patients and LDH in 3 patients. This increase in cell lysis factors has been observed in several studies [3] [5] [11] [19]. Troponin is a marker of muscle cell damage, especially myocardial damage. Its increase suggests cardiac damage in patients with COVID-19. The link between these two entities is suggested in many studies, and the mechanism would be related to the susceptibility of the myocardium and endothelial invasion by the virus, the hyper-inflammatory state, hypercoagulability, pro-thrombotic and indirect myocardial damage due to hypoxemia [29]-[31]. In a study, the authors aimed to analyze the prevalence of myocardial lesions by cardiac troponin type (I or T). Elevated levels were associated with increased 30-day mortality, and both types of cardiac troponin were also independent predictors of 30-day mortality [30]. Oikonomou E *et al.* also reported that cardiac biomarkers are significantly elevated in patients with severe COVID-19 and are independent predictors of mortality [31]. Troponin I and high-sensitivity troponin T are correlated with multiple inflammatory indices and poor prognosis. Monitoring these cardiac biomarkers can help the clinician assess patient outcomes [31].

Creatinine and azotemia were disturbed in some of our patients. An increase in creatinine corresponded to 30% of patients. There are 3 main lesions in the renal involvement of COVID-19: acute tubular necrosis in severe cases, proximal tubulopathy, which is a prognostic marker of the disease and segmental and focal hyaline [32]. The pathophysiology of this renal involvement is still poorly defined. The direct role of the virus is debated, while the cytokine storm and hypoxic and thrombotic complications apparently play a major role [32].

5. Conclusion

The extra-respiratory symptoms of COVID-19 are very diverse, with multiple organs and systems affected, making this viral infection a systemic pathology. It requires holistic management, hence the important role that internists can play, especially in developing countries where the number of specialists is limited. This preliminary study will serve to share experiences with countries sharing the same realities as Niger.

Conflicts of Interest

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

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