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Stroke and Covid-19: The Experience of the Ziguinchor/Senegal Epidemic Treatment Center

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Abstract

Introduction: SARS-CoV-2 infection seems to have a brain tropism involving several pathophysiological mechanisms. The objective of our work was to study the epidemiological, clinical, paraclinical and evolutionary aspects of stroke patients following SARS-CoV-2 infection. **Methodology:** This was a retrospective descriptive and analytical study from 26 March 2020 to 30 September 2021, which took place at the Ziguinchor epidemic treatment center. All patients infected with SARS-CoV-2 confirmed by RT-PCR with clinical signs suggestive of stroke and confirmed by brain CT scan were included in our study. Patients with incomplete or unexploitable records were excluded. **Results:** Twenty-four patients were collected out of a total of 186 severe cases, a prevalence of 12.90%. All patients had an ischemic stroke. The mean age was 69 ± 6 years with extremes of 58 and 84 years. The sex ratio (M/F) was 1.2. Diabetes and hypertension were co-morbidities in 87.50% and 25% of cases respectively. Clinical signs were dominated by a hemi-corporal deficit (87.5%) and dyspnea (75%). All patients were on anticoagulation and corticosteroids. The evolution was favourable in 62.5% of patients against 37.5% of death. **Conclusion:** SARS-CoV-2 infection is responsible for numerous neurovascular complications and this risk increases with the presence of diabetes, arterial hypertension and emboligenic heart disease. Corticosteroid therapy and anticoagulation have allowed us to improve the prognosis of patients.

Keywords

Covid-19, Stroke, Ziguinchor, Senegal

1. Introduction

Covid-19, a viral disease caused by the novel coronavirus SARS-Cov-2, is the first

large-scale pandemic of the 21st century. It is characterised by a state of hypercoagulability and a higher prevalence of thrombotic events that can affect all organs and rapidly engage the vital prognosis by its numerous complications. Thus, covid-19 can be considered as a systemic disease, responsible for vasculitis. These prothrombotic and pro-inflammatory pathophysiological mechanisms can affect nervous tissue, particularly the brain, and be responsible for a variety of neurological manifestations ranging from neurological symptoms of a sensory nature (anosmia, agueusia, etc.) to manifestations related to organic neurological damage (stroke, CVT, encephalitis or peripheral nervous system damage) [1]. Several studies on post-Covid-19 stroke have been conducted in China, USA and Europe, however, the prevalence and characteristics of stroke in patients infected with SARS-Cov-2 remain poorly known in Africa where most studies are based on case series only [2] [3]. The aim of our study was to describe the clinical, paraclinical, therapeutic and evolutionary characteristics of stroke patients infected with SARS-Cov-2 at the Ziguinchor epidemic treatment center.

2. Methods

This was a retrospective descriptive and analytical study from 26 March 2020 to 30 September 2021 that took place at the Ziguinchor epidemic treatment center. All patients infected with SARS-Cov-2 confirmed by RT-PCR with clinical signs suggestive of stroke and confirmed by brain CT scan were included in our study. Patients with incomplete or unexploitable records were excluded. Data were collected from the records of patients who were hospitalised and regularly monitored.

Data collected were:

- History: medical, surgical and gynaeco-obstetrical.
- Lifestyle: smoking and alcoholism.
- Clinical neurological and extraneurological signs.
- Brain imaging data (brain CT scan).
- Biological results (fasting blood sugar, lipid profile, HIV, urea, creatinemia, prothrombin level, active partial thromboplastin time, International Normalized Ratio, D-Dimer).

Cardiovascular check-up: electrocardiogram, cardiac ultrasound and supra-aortic trunk echodoppler.

The analysis of the data collected was done using Epi Data Stata version 16 software. We calculated the frequencies for the qualitative variables and the parameters of central tendency (mean) and dispersion (standard deviation) for the quantitative variables.

3. Results

During the three waves, 510 patients were treated in the Ziguinchor ETC (epidemic treatment centre), including 186 serious cases. Among these severe cases, 24 cases of stroke were recorded, representing a prevalence of 12.90%. All these

cases of stroke were of the ischaemic type. The average age of our patients was 69 ± 6 years with extremes of 58 and 84 years. The most represented age group was 64 to 74 years (see Figure 1). We noted a male predominance (58.33%) with a sex ratio (M/F) of 1.2. The most common comorbidities in our study were high blood pressure (87.5%), high-risk embolism heart disease (37.5%) and diabetes (25%) (see Figure 2). The heart diseases encountered were atrial fibrillation (3 cases), ischaemic heart disease (5 cases) and dilated cardiomyopathy with severe impairment of systolic ejection fraction (1 case). The majority of cases (15/24) had presented with a neurological deficit on average 12.5 days after the first symptoms of Covid-19 with extremes of 9 to 16 days. In contrast, stroke was the circumstance of discovery of Covid-19 in 09 patients. The clinical neurological manifestations were diverse but dominated by motor deficits (87.50%) and consciousness disorders (39%). The extra-neurological signs were mainly dyspnoea (75%) and cough (58.33%) (see Figure 3). Biologically, 66.67% of the patients

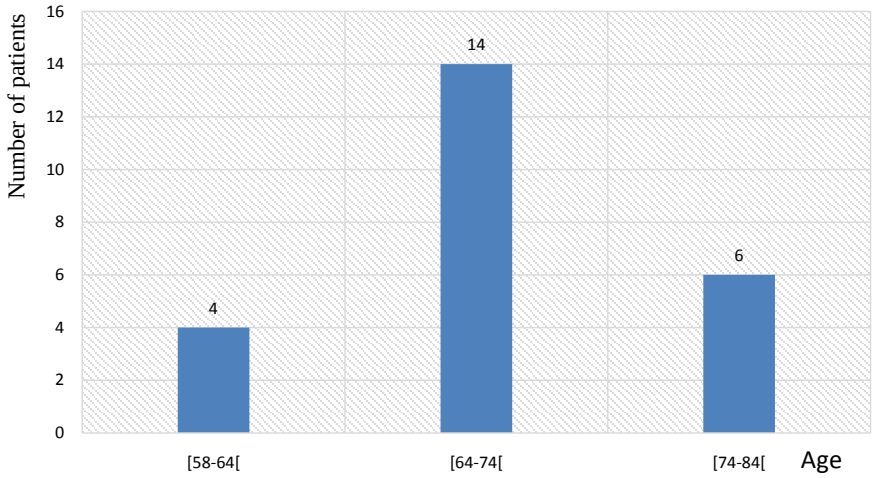

Figure 1. Distribution of patients by age group.

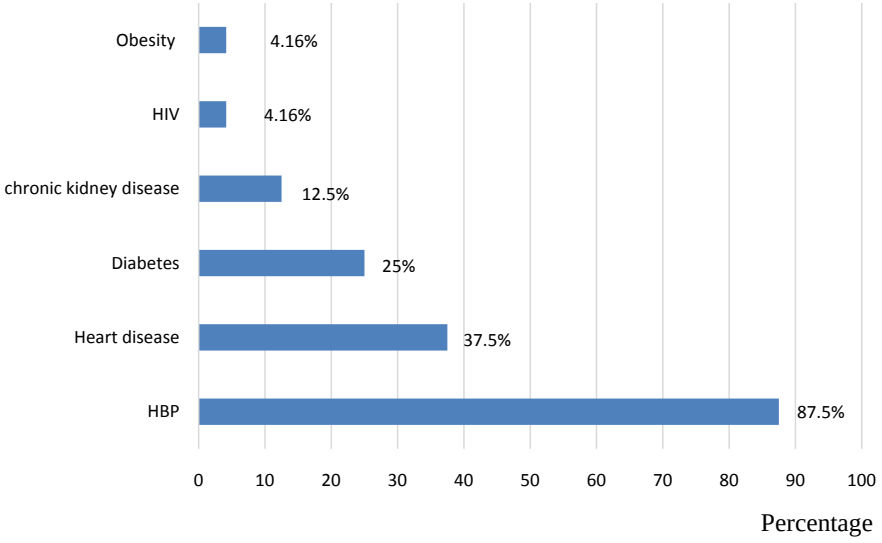

Figure 2. Distribution of patients according to comorbidities.

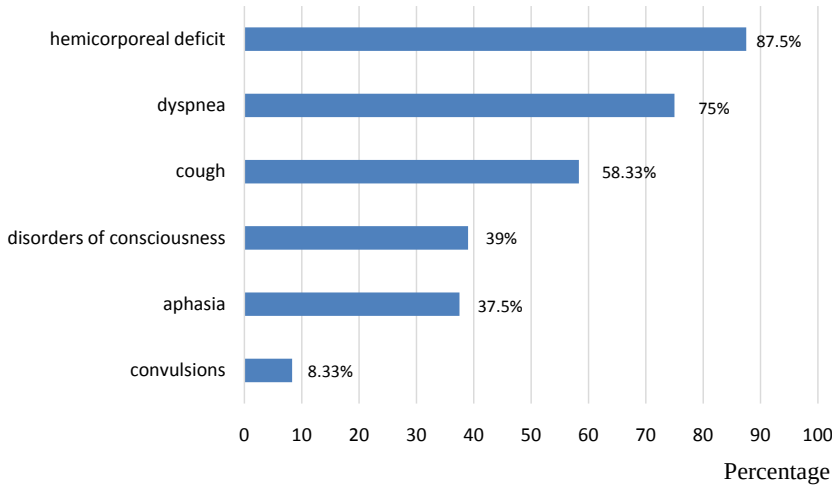

Figure 3. Distribution of different clinical signs.

had a predominantly neutrophilic hyperleukocytosis with a mean of 15.85 × 10^3/mm^3 and extremes of 11 and 22 × 10^3/mm^3. The anaemia observed in 8 patients was hypochromic and microcytic, mild in 6 patients and moderate in 2 patients with haemoglobin levels ranging from 6.3 to 10.9 g/dl. Thirteen patients had moderate thrombocytopenia with a mean of 110 × 10^3/mm^3 and extremes of 92 and 123 × 10^3/mm^3) and two patients had low prothrombin levels (58% and 61% respectively). The C-reactive protein was positive in all our patients and 79.17% had a CRP above 96 mg/l. D-dimer was positive in all patients with extremes ranging from 3000 to 13,000. Cerebral CT scans showed ischemic stroke in all our patients, the middle cerebral artery was the most affected and the cerebral infarction was multiple in 5 patients (see Table 1). Six patients had malignant infarction with signs of cerebral involvement on CT. Five patients had pulmonary embolism and ten patients had moderate Covid-19 lung damage (less than 25% involvement on chest CT). Two patients had, in addition to ischemic stroke, arterial ischaemia of the upper limbs. All patients were on curative anticoagulation (enoxaparin 100 IU/kg in two doses spaced 12 hours apart), dexamethasone 8 mg/24H and azithromycin. The average length of hospital stay for patients was 25 days ± 7.3 with extremes of 12 and 65 days. Discharge criteria were neurological and respiratory stabilisation and negative D-dimer values. Nine of our patients continued curative anticoagulation after discharge (6 on acenocoumarol and 3 on rivaroxaban). The outcome was favourable in 62.5% of the patients and 37.5% died. Confusional syndrome was the factor most associated with death in our study (see Table 2). After one year of follow-up, no recurrence of stroke was noted, and no patient showed cognitive impairment. Only two patients had persistent seizures after discharge.

4. Discussion

The occurrence of stroke during Covid-19 is infrequent with results varying between studies, ranging from 1.7% to 6% [4] [5] [6]. In the same vein, the World

Table 1. Topography of cerebral infarction on imaging.

Artery involved	Frequency	Percentage (%)
Anterior cerebral artery	5	20.83
Middle cerebral artery	13	54.16
Unilateral	11	45.83
Bilateral	02	8.33
Posterior cerebral artery	02	8.33
Anterior and middle cerebral artery	04	16.66

Table 2. Multivariate analysis of factors associated with death.

Factors related to death	**OR**	**P**	**CI: 95%**
Age ≥ 65 ans	5.33	0.158	[0.52 - 54.34]
SpO_2 < 90%	3.43	0.165	[0.601 - 19.64]
HBP	0.25	0.290	[0.019 - 3.25]
Diabetes	2	0.469	[0.306 - 13.06]
Confusional syndrome	103	0.002	[5.67 - 1905]

Stroke Organization reported that the risk of ischaemic stroke during Covid-19 was approximately 5% (95% confidence interval [CI]: 2.8% - 8.7%) [7]. In a 2020 meta-analysis, stroke was the second most common neurological complication of Covid-19 after encephalitis [8]. In some French and English studies, stroke accounted for 28.4% and 62% of all neurological complications of Covid-19 respectively and the majority of these were ischaemic strokes [1] [3] [9]. In Africa, most studies are based on case series [2] [3]. In our study the incidence of stroke was 12.90% in patients hospitalised for Covid-19. The mean age in our study was 69.83 years with extremes of 58 and 84 years. The most represented age group was 64 - 74 years, which was similar to data in the literature where stroke occurred at a younger age compared to a non-Covid-19 infected population [10].

Clinical manifestations of stroke occur most often within 10 days of the onset of symptoms [4] [5] [10]. However, some authors have reported cases of stroke that were indicative of Covid-19 [11]. In our study, the majority of patients had their stroke on average 12 days after the first symptoms of Covid-19. The factors linked to the occurrence of stroke are multiple, firstly hypercoagulability, vasculitis and classic cardiovascular risk factors (hypertension, diabetes, obesity, etc.) [12] [13] [14]. Hypercoagulability was characterised by elevated D-dimer levels, thrombocytopenia, decreased fibrinogen levels and hyperleukocytosis [15]. This hypercoagulable state was found in our study with D-dimer levels ranging from 7000 to 13000. Antiphospholipid antibodies (anticardiolipin and anti-β-glycoprotein I antibodies) have been found in Covid-19 patients with multiple hemispheric infarcts [9]. In our study, antiphospholipid antibodies were not found in patients with multiple post-Covid-19 infarcts.

In the literature, numerous studies have reported the use of anticoagulation in the primary and secondary prevention of Covid-19-related ischemia stroke [16] [17]. The optimal dose of anticoagulation remains unknown, however, the significantly high number of macrovascular thrombosis (16% - 47%) in critically ill Covid-19 patients despite the use of preventive low molecular weight heparin suggests inadequate dosage [18] [19]. In our study, curative dose anticoagulation was routine in all patients. A meta-analysis coordinated by WHO and the University of Bristol, which included 7 international studies from 12 countries with a total of 1703 patients, showed a 21% reduction in all-cause mortality at 28 days when patients were treated with dexamethasone, hydrocortisone or methylprednisolone versus placebo and standard care [20]. Dexamethasone 8 mg/24H was used in all our patients and the outcome was favourable in 62.5% versus 37.5% of deaths.

5. Limitation of the Study

In our study, magnetic resonance imaging would be a great contribution to the diagnosis of cerebral lesions. The determination of coagulation proteins or certain antibodies would be beneficial for a better understanding of thrombo-embolic phenomena.

6. Conclusion

Stroke is one of the most common neurological injuries after a SARS-CoV-2 infection. Anticoagulation and management of secondary systemic brain injury are the cornerstones of treatment.

Conflicts of Interest

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

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