

The Initial Management of the Covid-19 Outbreak in Senegal

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Abstract

Background: The COVID-19 pandemic continues to spread around the world. The African continent did not remain. Senegal is one of the most affected African countries and has demonstrated its capacity to manage this outbreak. Our aim is to share the epidemiological aspects of COVID-19 and the strategy put in place during the first 6 months of evolution.

Method: All patients tested COVID-19 positive by RT-PCR were recorded during the first six months of the epidemic: from March 2, 2020 (date of the first case) to September 2, 2020, across the entire national territory. An analysis of the epidemiological data was carried out.

Results: With 13,826 positive cases recorded in six months, the impact was less than expected, with mortality not exceeding 2.08%. All regions of Senegal are affected, with the epicenter in Dakar, the capital. Male predominance is noted in the number of positive cases and deaths. The young population was the most affected with an average age of 41 years. Those over 60 years of age were the most vulnerable, particularly with cardiovascular co-morbidities.

Conclusion: The dynamic of the management strategy has made it possible to ensure the resilience of the health system through the implementation of care centers throughout the country and decentralized mobile laboratories. The VIDOC-19 pandemic has put a strain on our fragile health systems. However, the response and the results achieved highlight the significant progress made by our country.

Introduction

The outbreak of a new Severe Acute Respiratory Syndrome (SARS) that broke out in Wuhan, China (Zhu N, 2020) in late December 2019, has finished its world tour. Today all continents are affected (WHO, 2020) and health systems are under severe strain (Eltoukhy AEE, 2020) [3]. Initially named the New Coronavirus of 2019 (2019-nCoV), it was later officially named COVID-19 by the World Health Organization (WHO) (Li Q, 2020). Its global spread has been prompt. On January 30th, 2020, the WHO declared it a Public Health Emergency of International Concern (WHO, 2020). With human-to-human transmission and an incubation period generally between 2 and 14 days, the typical symptoms of COVID-19 are mainly fever, dry cough, fatigue, and the progressive onset of dyspnea. Severe cases of COVID-19 can develop severe pneumonia, acute respiratory distress syndrome and multi-visceral failure which can be fatal. Clinical particularities are noted in the different continents.

Senegal confirmed its first imported case from Europe on March 2nd, 2020. Six months later, the epidemic affected all regions of the country, which had to report at least one case each. This work describes the epidemiological evolution of the disease in Senegal and the response strategies implemented to contain it.

Material and Method

Study site

Senegal is the westernmost country on the Atlantic coast of the African continent. It borders five countries: Mali to the east, Mauritania to the north, the Republics of Guinea and Guinea Bissau to the south and the Gambia, landlocked in central Senegal (figure 1). It covers an area of 196,722 km² and is divided into 14 administrative regions. The population is estimated at 16,209,125 inhabitants in 2019 (ANSD, 2020) of which 23% are concentrated in Dakar, the capital of the country.

Senegal's health system is organized in a pyramidal fashion with health huts at the base and university hospitals at the top. There are 14 medical regions superimposed on the administrative regions. Each medical region is divided into 79 health districts (Figure 2). Senegal has 35 public hospitals, 102 health centers and 1415 health posts. (MSAS, 2019).

Dedicated treatment sites for the management of confirmed COVID-19 cases have gradually been set up throughout the country.

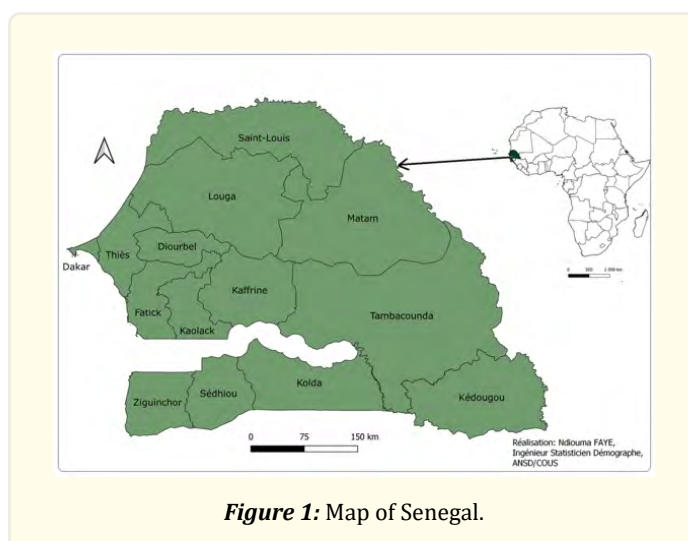
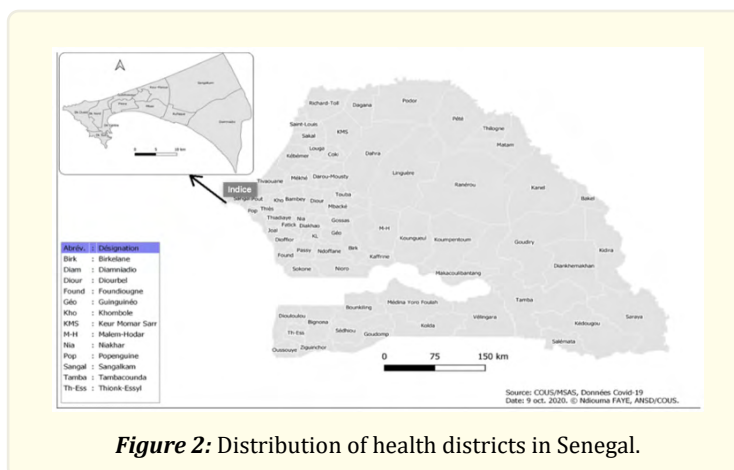


Figure 1: Map of Senegal.



Study period

It covers 6 months, from March 02nd, date of confirmation of the first case, to September 02nd, 2020.

Study population

The study covers all positive RT-PCR cases reported during the period throughout the country.

Testing

In terms of diagnosis, initially, two laboratories located in Dakar were involved in the detection of suspect cases: *the Institut Pasteur de Dakar* (IPD), the first laboratory involved which confirmed the first case, and the *Institut de Recherche EnSanté de Surveillance Epidémiologique et de Formation* (IRESSEF). The *Institut Pasteur* was able to deploy two mobile laboratories at two regional sites: Touba and Kolda. IRESSEF's screening site was exclusively in the region of Thiès.

Following the reopening of Dakar's international airport, 3 other laboratories were involved in the screening of travelers to and from Senegal: the laboratory of the *Hôpital Militaire de Ouakam* (HMO), the *Laboratoire de Bactériologie et de Virologie de l'Hôpital Aristide Le Dantec* (LBV, HALD) and the *Laboratoire National de Santé Publique* (LNSP).

Health care and support

At the beginning of the pandemic, the strategy was to manage all positive cases, whether symptomatic or not, in COVID treatment centers. Hospital care sites were gradually set up according to the increase in the number of cases and their geographical location. The objective was to provide each region with at least one site with its own capacity to manage confirmed COVID-19 cases in its area of responsibility. In view of the increase and geographical extension of positive cases, non-hospital sites were set up. These included hotels, reception centers, stadiums, etc. As a result, 36 care sites have been set up throughout the country: 27 hospital sites and 9 non-hospital ones.

State measures of national scope to contain the pandemic (figure 3)

Strong measures were taken by the President of the Republic to contain the pandemic, firstly by fully financing the Preparedness and Response Plan drawn up by the Ministry of Health with a budget of \$2,409,000.

Thus, the State decided on March 14th, 2020:

- A ban on public demonstrations for 30 days;
- Suspension of teaching in schools and universities for a period of three weeks, starting on Monday 16 of March 2020;
- Temporary suppression of the reception of cruise ships;
- Suspension of national formalities linked to the pilgrimage of the year 2020 to the holy places of Islam and Christianity;
- Ceremony of taking up arms in place of the military parade for the celebration of the bank holiday of 04 April.

As of March 18th, 2020:

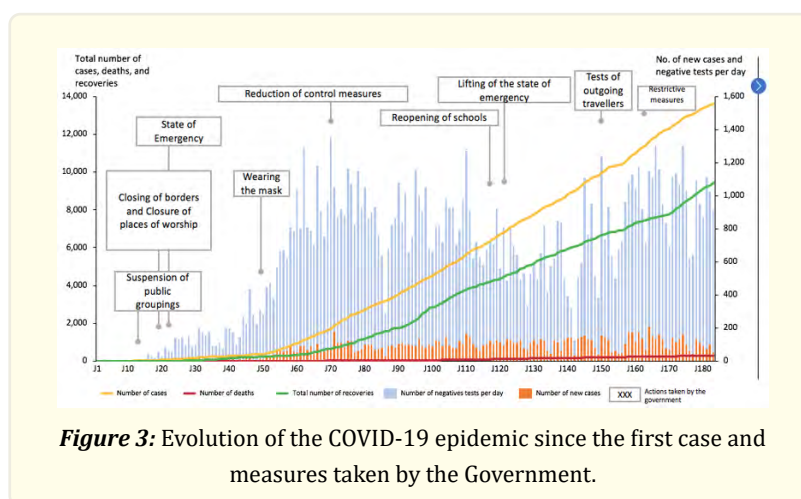
- Suspension of all flights to and from the following countries: France, Spain, Italy, Belgium, Tunisia, and Algeria.

As of March 20th, 2020:

- Suspension of all flights to and from Senegal's airports except for domestic flights to Ziguinchor. Exception for cargo flights, medical evacuations and special flights authorized.

As of March 24th, 2020:

- Declaration of a state of emergency and curfew from 8 pm to 6 am.



Results

Patients

As of September 02nd, 2020, 13,826 cases of Covid-19 have been recorded and distributed over the 14 regions, with Dakar, Thiès and Diourbel being the most affected (Figure 4). A total of 70 health districts out of 79 are affected, i.e., 88.61% (figure 5). All cases were confirmed by a positive RT PCR test.

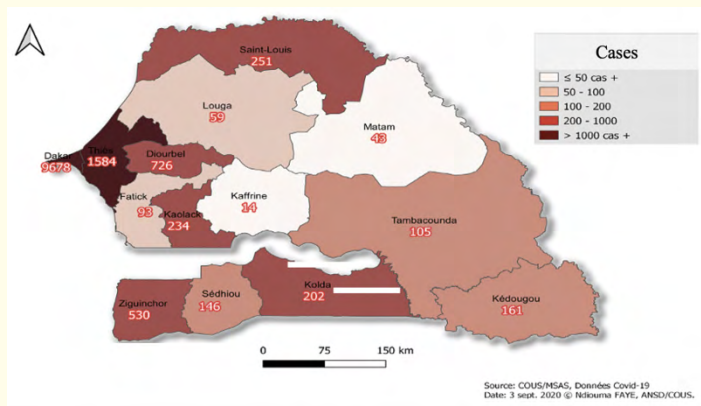


Figure 4: Distribution of Covid-19 cases by region.

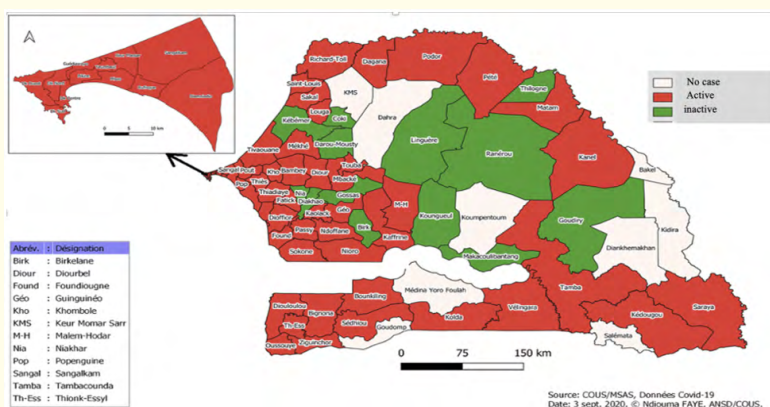


Figure 5: Distribution of Covid-19 cases by health districts.

The number of confirmed cases has increased with a daily average of 75 cases, with extremes of 1 and 207 cases. (Figure 6).

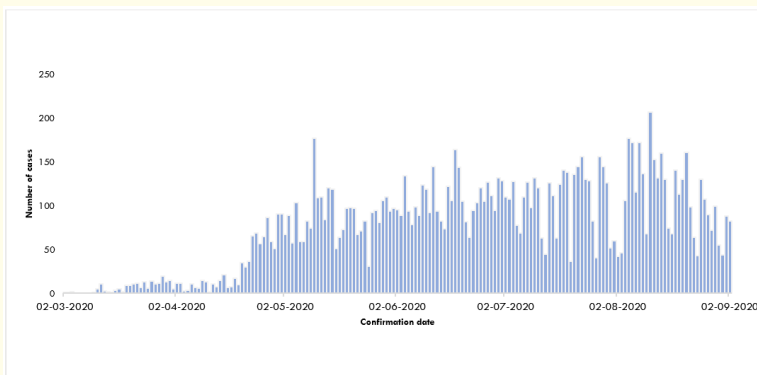


Figure 6: Epidemiological curve of confirmed COVID-19 cases in Senegal.

The positive cases were divided into three groups: imported cases (infection detected in a traveler entering Senegal), contact cases (contamination of a known person followed as a contact by a confirmed case on the national territory) and community cases (source of contamination not identified on the national territory). Among the 13826 confirmed cases, 10323 (74.6%) were contact cases, 3311 (24%) were cases from community-to-community transmission, and 192 (1.4%) were imported (Figure 7). The first case of Community transmission was registered on 19 March 2020 in the Diourbel region.

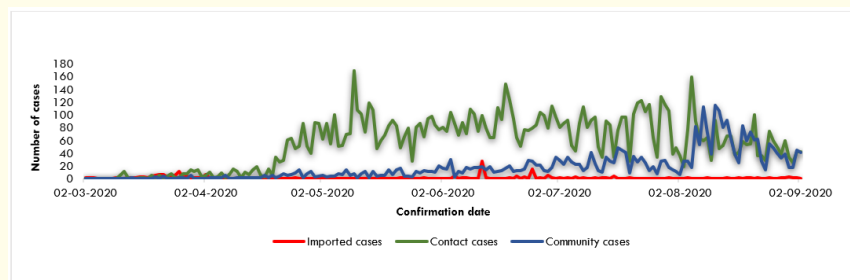


Figure 7: Epidemiological curve of confirmed cases of COVID-19 as a function of the type of transmission.

Age and Gender

A male predominance was observed with a proportion of 58.22% men and 41.78% women. The average age was 41 years with extremes of 7 months and 101 years.

Recovery, serious cases, and deaths

As of 02 September 2020, 9553 patients have been declared cured, with a cure rate of 69.09%. Patients are declared cured following 2 negative RT-PCR tests taken 48 hours apart. During this period, 257 serious cases (Figure 8) and 287 deaths were recorded.

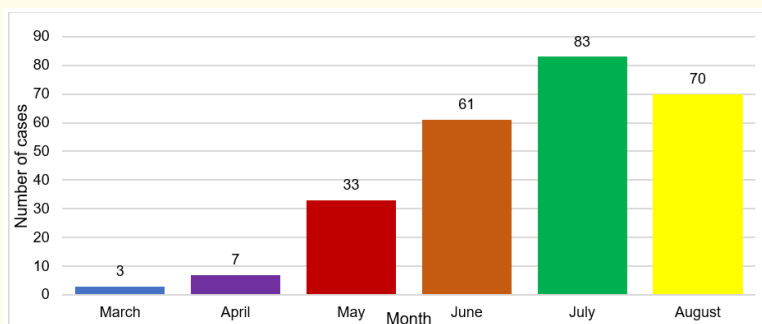


Figure 8: Monthly evolution of severe cases of COVID-19 in Senegal.

The case-fatality rate was 2.08%. (Table 1). A total of 216 deaths were recorded among the serious cases, i.e., a percentage of 75.26%. The average age of the deceased was 68 years with extremes of 24 and 101 years. Men were in the majority with 78% of the cases. (Table 2) Deaths were recorded in treatment centers (74%), health facilities outside treatment centers (11%) and at home (15%) (Table 3). A total of 89% of the deceased had co-morbidities (Table 4).

<i>Distribution of types of positive cases(%)</i>	<i>Community cases</i>	<i>Contact cases</i>	<i>Imported cases</i>	<i>Recovery rate</i>	<i>Lethality rate</i>
	23.95	74.69	1.37	69.09	2.08

Table 1: Percentages of different types of positive cases, recovery rates and lethality.

<i>Age range (years)</i>	<i>Male sex (n)</i>	<i>Female sex (n)</i>	<i>Total(n)</i>	<i>Proportion (%)</i>
0-4 years	0	0	0	0%
5-14 years	0	0	0	0%
15-19 years	0	0	0	0%
20-39 years	5	8	13	4,5%
40- 59 years	28	14	42	14,7%
60 years and +	191	41	232	80,8%
Total	224	63	287	100%

Table 2: Distribution of patients whodiedfrom COVID-19 in Senegal by age group and sex.

<i>Place of death</i>	<i>Number (n)</i>	<i>Proportion (%)</i>
Epidemiological Health Center	214	74 %
Health Structure	30	11 %
Home	43	15 %
Total	287	100%

Table 3: Distribution of COVID-19 deaths in Senegal by location.

<i>Type of comorbidity</i>	<i>Number (n)</i>	<i>Proportion (%)</i>
Hypertension Blood Pressure	79	30,9%
Diabetes	77	30,1%
Cerebrovascular accident	23	9%
Obesity	17	6,6%
Cardiopathy	16	6,2%
Kidney disease	8	3,1%
Asthma	6	2,3%
Chronic Obstructive Pulmonary Disease (COPD)	4	1,6%
Others	26	10,2%
Total	256	-

Table 4: Distribution of co-morbiditiespresent in patients whodiedfrom COVID-19.

Testing for COVID-19

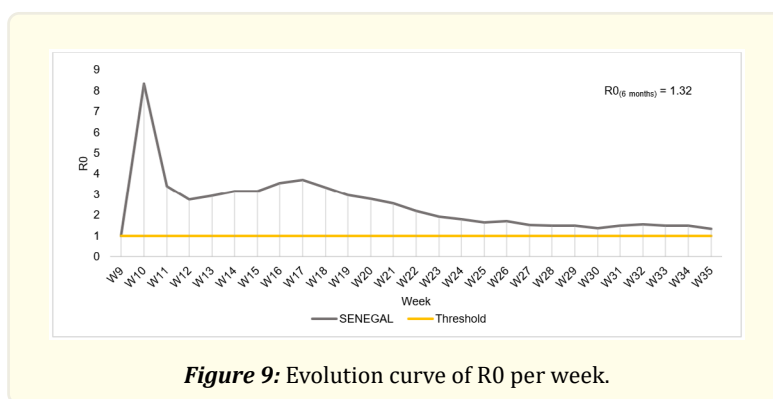
Between 02nd, March and September 02nd, 2020, a total of 157838 Covid-19 screening tests were carried out in 5 different laboratories. Of these tests, 13826 were positive, i.e. a positivity rate of 8.76%. Most of the positive cases were detected by the laboratories of the Pasteur Institute of Dakar (Table 5).

Age range (years)	Male sex (n)	Female sex (n)	Total (n)	Proportion (%)
0-4 years	143	127	270	2%
5-14 years	316	311	627	4,5%
15-19 years	309	322	631	4,6%
20-39 years	2358	3032	5390	39%
40- 59 years	2401	1550	3951	28,5%
60 years and +	1840	1117	2957	21,4%
Total	7367	6459	13 826	100%

Table 5: Age and sex distribution of the population with COVID-19 in Senegal.

Reproduction rate and attack rate

The average reproduction rate (R_0) of COVID-19 after 6 months of the epidemic in Senegal was 2.44, with a peak of 8.33 at the beginning of the epidemic (figure 9). The cumulative national attack rate was 82.76 per 100,000 inhabitants, with Dakar being the most affected region with an attack rate of 252.36 (Table 4).



Region	Population	Number of COVID-19 cases	Proportion of positive cases (%)	Attack rate / 100,000 inhabitants
Dakar	3 835 019	9678	70,00	252,36
Thiès	2 162 831	1584	11,46	73,24
Diourbel	1 859 503	726	5,25	39,04
Kaolack	1 191 566	234	1,69	19,64
Saint-Louis	1 091 740	251	1,82	22,99
Louga	1 061 607	59	0,43	5,56
Fatick	900 791	93	0,67	10,32
Tambacounda	872 156	105	0,76	12,04
Kolda	821 998	202	1,46	24,57
Matam	732 866	43	0,31	5,87
Kaffrine	728 948	14	0,10	1,92
Ziguinchor	683 952	530	3,83	77,49

Sédhiou	572 099	146	1,06	25,52
Kédougou	190 513	161	1,16	84,51
Total/Average	16 705 589	13 826	100,00	82,76

Table 6: Situation of attack rates by Region.

Discussion

After six months of the epidemic, the resilience of Senegal's health system has been severely tested. Despite all the measures taken during the preparation phase, the epidemic wave could not be prevented. However, it was somehow managed to be contained. Senegal is one of the first African countries to be affected (WHO, 2020). Having an important air traffic to Europe, the first case was imported from France. Indeed, importation was initially the first type of contamination in Africa (R, 2020). With 13,826 cases in 6 months for a population of more than 16 million inhabitants, i.e. an incidence of 0.24%, the impact of COVID-19 was not as dramatic as predictions suggested. Several hypotheses have been put forward concerning this low impact (Liao H, 2020) (Gilbert M, 2020). However, beyond environmental and population issues, the quick response and lessons learned from previous major epidemics, such as Ebola in West Africa in 2014, have enabled Senegal and many other African countries to refine their preparedness and response capacity to public health emergencies. All 14 regions were affected. However, of the 79 health districts, only nine never had any cases. These nine districts are in five regions (Louga, Tambacounda, Kédougou, Kolda and Sédhiou). Senegal is the 10th most affected country in Africa in terms of the number of confirmed cases (Meo SA, 2020). Senegal's strategy has been dynamic, considering the local context and current scientific data. Early on, within 3 weeks after the appearance of the first case, strong measures were taken by the authorities to restrict people's movement: prohibition of public demonstrations, restriction of interurban transport. The obligation to wear masks in public places and on transport was decided on April 7th, 2020, and the actions taken very early on to prevent transmission on public transport were noteworthy, as it is the main means of movement for the population in urban and interurban areas, especially as transport is recognized as the preferred way of contamination (Shen J, 2020). The closure of land and air borders was also a decision that had an impact on the progression of the epidemic (Chinazzi M, 2020) (Errett N, 2020), even though the World Health Organization does not recommend it (Sharifi A, 2020) these measures taken between weeks 11 and 15 had an impact on the reproduction rate of the virus, which fell from 8.33 to 1. The attack rate averaged 82.76 per 100,000 inhabitants over the six months, with extremes of 252.36 in Dakar and 1.92 in Kaffrine. Nearly 70% of cases are located in Dakar, the capital, concentrating around 23% of the population. In most countries, the capital is generally the epicenter of the epidemic (WHO, 2020) and (NCDC, 2020).

Senegal's population is characterized by its youth: slightly more than half of this population (50.04%) is under 19 years old [6]; this can be seen in the proportion of young people affected. The average age of patients was 41 years, with extremes of 7 months and 101 years. The oldest patient unfortunately died because of his illness. Half of the patients are under 40 years of age and 39% are between 20 and 39 years of age. Those over 60 years of age affected represent 21.4%.

We also note a male predominance, with 58.22% of men and 41.78% of women, and this is also found in several studies (Li Q, 2020) (CDC, 2020). Children, who are generally slightly affected, (Lee PI, 2020) represent 6.5% (under 14 years of age). The first cases were initially imported, then contacts of these cases were infected. This was the case for most African countries which could not avoid being affected by this pandemic (Gilbert M, 2020) (Sun H, 2020). The first case of community transmission was identified on March 19th, 2020. This phase of community transmission intensified transmission throughout the country, creating at times a certain psychosis in the population. The fear of the "community case" led the population to respect the barrier measures. More than 150,000 tests were carried out by five laboratories, with a positivity rate of 8.76%. The Institute Pasteur was the first laboratory able to make the diagnosis, until March 30th. It had carried out nearly 80% of the tests, with their laboratory decentralized to the outlying regions. The increase in the number of approved laboratories and the decentralization strategy aimed to reduce the time taken to deliver results to less than 48 hours.

A total of 38,612 contacts have been recorded as of September 02nd 2020. The proportion of follow-up contacts is 92%. This follow-up has evolved because of the strong stigmatization of the district teams, with threats to their physical integrity. Physical follow-up has given way to mobile phone follow-up. This activity at the beginning of the epidemic is fundamental to its control (Hellewell J, 2020).

Serious cases represented 2.6% of patients. Among the deceased ones, 75.26% were serious cases. The case-fatality rate was 2.1%. Deaths were noted in 3 places: treatment centers (74%), health facilities outside treatment centers (11%) and homes (15%). In the homes, the deaths were post-mortem diagnoses. The high proportion of deaths at home was largely due to the stigma surrounding the disease and people's fear of attending health facilities. The average age of the deceased was 68 years, with a large majority of males. People over 60 years of age accounted for 80.8% of deaths; this is also found in the literature (Onder G, 2020). Patients over 60 years of age appear to be more at risk (Bonanad C, 2020) (Medzikovic L, 2020). Among the deceased, 61% had at least one diabetes or high blood pressure; these pathologies are the most common co-morbidities (Verity R, 2020). Cardiovascular diseases are recognized as an important risk factor (Zhou F, 2020). Only 3.9% had a respiratory pathology (chronic obstructive pulmonary disease or asthma). Of people aged between 20 and 39, only 4.5% died. Deaths have been noted in the literature among children (Zhou MY, 2020) but in our series we did not note any deaths among people under 20 years of age. Care capacities have been developed while keeping as a guideline the continuity of care provision for other conditions and accessibility in all parts of the country. The redeployment of health staff, the mobilization of medical students at the end of their studies and able-bodied retired staff have made it possible to sustain the resilience of the hospital system.

Conclusion

The COVID-19 pandemic continues to be a major threat to Senegal, despite the efforts made and the results achieved. A dynamic management strategy has been adopted, considering the local context, available means and scientific knowledge. Lessons learned from the various public health events have also contributed to strengthening the country's capacity to prepare for and manage health crises.

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