

Epidemic Trend of Corona Virus Disease 2019 (COVID-19) and public Health response in Senegal

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Abstract

Background

The first case of Covid-19 was notified in Senegal on March 2, 2020. One month after, this study aims to analyze the trend and the main measures that have been taken.

Methods

Data sources are from the Department of Disease Prevention in Senegal and some administrative documents. The epidemic trend has been described through epidemic curves according to the characteristics of infected people.

Results

Of the 195 patients tested positive for COVID-19, a proportion of 53.8% is female. Six out of 14 regions were affected by the epidemic on April 1, 2020. The mean age is 37.9 years with a standard deviation of 18.6 years. The proportion of imported cases is 39.5%. The major strategy in Senegal is based on the isolation of cases for treatment and tracking of contacts. Decisions have been made to limit spread of the virus through social distancing. Airlines have been closed and border control strengthened.

Conclusions

The preparation and the measures taken made it possible to contain the pandemic during the first month. However, there is a need to strengthen the surveillance following the appearance of community-based cases and readjust strategies to hope to contain the pandemic during the second month.

Background

On December 31st, 2019, Chinese authorities reported to the World Health Organization (WHO) pneumonia cases, caused by a coronavirus in Wuhan city, Hubei Province (1). Later, WHO named the disease as COVID-19. On March 11, 2020, WHO declared the new coronavirus (COVID-19) disease outbreak as a pandemic and invites governments to take immediate measures to limit its spread and to ensure compliance with international health regulations. Globally, on April 1st, 2020, the COVID-19 epidemic affected nearly 823,626 people, including 40,598 deaths in 185 affected countries (2).

On March 2nd, 2020, from the onset of the COVID-19 epidemic with the registration of an imported case, Senegal implemented a response plan covering the period of February-July 2020 with several modular phases depending on the current epidemiological situation (3). The strategic axes of the plan were (i) the strengthening of surveillance for the early detection of cases; (ii) the chain of transmission's interruption

by isolating confirmed cases and confining their contacts; (iii) the protection of health personnel by the application of infection prevention and control measures and consistent implementation of activities through good coordination.

Current knowledge on the virus shows scientific uncertainties. However, COVID-19 has been found to spread at a high speed with often unpredictable behavior. The basic reproduction rate which was estimated between 2.5 and 3 (4) is revised upwards to 5.7 (5). The serial interval often varies from study to study (4, 5). This has led some countries to take drastic measures ranging from a ban on assembly to complete containment of the population (6, 7).

After a month of pandemic in Senegal, it is important to analyze the dynamics of the epidemic for establishing its profile and the measures taken by the Government of Senegal (GOS) to stem the epidemic.

Setting

Sudano-Sahelian country located in the far west of Africa, the population of Senegal is estimated at 16,209,125 inhabitants in 2019 (8) with an average density of 82 inhabitants per km². In 2018, the percentage of children in full-time education in Senegal was 80.9% (9) and a per capita GDP of \$1,521 associated with a poverty line of 34%. Which ranks Senegal at 166th place according to the United Nations Development Program (10) with an HDI of 0.514).

Senegal has four international airports: Dakar (Léopold Sedar Senghor airport), Thies (Blaise Diagne airport), Saint Louis and Ziguinchor, with facilities meeting international safety and security standards. Regarding maritime transport, the country has two ports, one of which is in Dakar (11).

The Senegalese health system is organized according to a pyramid structure at three levels: central, intermediate, and peripheral (MoH). Services are provided at public health establishments; health centers, health posts and health huts for the public sector (12). Senegal has 1,623 doctors, two thirds of whom work in the public sector. Almost 40% of paramedical personnel work in the private sector (12).

Method

It is a prospective study which involved the collection of cases registered by the services of the MoH. Data on the suspected case is collected from an investigation sheet adapted from the generic WHO form (13). Then a nasopharyngeal sample is taken and put in a triple package which will be sent to the laboratory for analysis. For each case confirmed by the laboratory, the data are entered in an Excel model with the socio-demographic characteristics of the case, the history of the disease, the signs presented, the notion of contact with a case of Covid-19, the notion of travel. within 14 days of the onset of signs and laboratory results.

As part of this epidemic, the MoH has set up an alert system. It is an essential compartment of our system and its role is to centralize all suspicious signals, analyze them, sort them according to their relevance and, if necessary, validate them after preliminary investigation. Following this validation, the alert is immediately transmitted to the health district for secondary investigation in accordance with the algorithm. The Prevention Department (MoH) hosts the system and is staffed with 28 trained agents. Coordination is ensured by a public health doctor supported by five physicians and two senior technicians. The alert cell team can answer 15 calls through three landlines and one call center. The calls can come from different signals that may come from the community, health structures, the National Service of Education and Information for Health toll-free number and the national Medical and Emergency Assistance Service. The cell can be reached 7/7 and 24/24.

A suspect case is defined as:

- A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory illness (e.g., cough, shortness of breath) AND no other etiology that fully explains his clinical presentation and history of travel to or residence in a country, zone or territory reporting local transmission of COVID-19 disease within 14 days prior to the onset of symptoms;
- A patient with acute respiratory illness AND who has been in *contact with* a confirmed or probable case of COVID-19 (see definition of contact) within the last 14 days before the onset of symptoms;
- A patient with severe acute respiratory infection (fever and at least one sign/symptom of respiratory illness (e.g. cough, shortness of breath) AND requiring hospitalization AND with no other etiology that fully explains the WHO-adapted clinical presentation.

A case is called imported if he comes from outside Senegal; local if the contamination occurred in Senegal. Local cases are community-based if no contact with a followed case has been reported according to the WHO definition (13).

As soon as a case is tested positive, he is isolated in a treatment center; close contacts are quarantined for 14 days in a local hotel and tested. Recovery is declared after two negative tests within 48 hours.

Data analysis

Qualitative variables were described according to frequency and quantitative variables according to mean and standard deviation. The analysis also included epidemic curves according to certain characteristics such as sex, age, region of residence, and case status. A content analysis and a triangulation of the sources made it possible to analyze the different measures implemented in Senegal.

Results

Of the 195 patients who tested positive for COVID-19, 53.8% were female. The sex ratio is 0.86. On April 1st, 2020, six out of 14 regions are affected by the epidemic. Dakar region recorded 70.8% of the cases,

followed by the regions of Diourbel (13.3%) and Thies (12.3%). The proportion of imported cases is 39.5%, contact cases 55.4% and community-based cases 5.1%. Patients who travelled abroad during the 14 days preceding their symptom represented 31.8%. Most patients' age ranges from 20 yrs. to 59 yrs.; i.e., 69.2% (Table 1). The mean age is 37.9 years with a standard deviation of 18.6 years. The age ranged from 2 months to 80 years.

The first case of Covid-19 was detected in Senegal on March 2nd, 2020. Thirty days later, 195 cases were recorded. The evolution of cases according to the type shows that the first cases were imported. The first case originated from France. The first local case appeared on March 10th, 2020, following a contact traced from a Italy's case. The first community-based case was detected on March 20th, 2020 (Fig. 2).

A total of six regions are affected by Covid-19. The first cases appeared in the Dakar region. Then the epicenter of the epidemic moved to Diourbel. For four days, most cases were observed in Diourbel (center of Senegal). The first local case was also observed there. After a few sporadic cases in Thies and Ziguinchor, most cases were noted in Dakar which is currently the epicenter of the epidemic (Fig. 3).

On April 1st, 2020, 195 cases had been recorded with 71.3% under treatment, 28.2% cured and 0.5% dead. The doubling time for cases was then six days (Fig. 4). As soon as the epidemic appeared in China, the GOS started to implement a system. On January 27th, 2020, a memo has been circulated Regional Medical Chiefs via the Governors, ordering to reinforce surveillance, disseminate technical data sheets and organize the management of suspect cases. On January 30th, 2020, another memo requested all public and private structures to report any suspicious case of Covid-19 to the alert cell reachable 24-hour. Four referral hospitals were already set for care support of confirmed Covid-19 cases.

A national crisis management committee has been set under the leadership of the Director General of Health. Same Committees have been established at regional level. The management of operations has been entrusted to the Health Emergency Operations Center (HEOC).

The major strategy in Senegal is based on the isolation of cases for treatment and the monitoring of contacts. The evolution of cases has led to the implementation of progressive measures. The President of the Republic has taken decisions to limit the spread of the virus by banning clusters, closing schools and universities, and banning prayer in mosques and churches. A curfew from 8 p.m. to 6 a.m is set. Airlines have been closed and border controls tightened (Table 2).

Discussion

One month after its onset in Senegal, the evolution of the pandemic seems slow, as for most African countries, unlike Europe and the Americas (14, 15). Several contextual factors have been mentioned to explain this situation as vaccination against certain diseases such as tuberculosis (16). However, the low diagnostic capacity encountered in these countries may also explain this situation. The appearance of community-based cases in Senegal since March 21st, 2020, suggests that not all the existing cases are reported (17). Active surveillance should be carried out to better assess the extent of these community-

based cases. It is also important to readjust the definition of suspect cases. The results of our study show a slight predominance of women which is consistent with the distribution of women in the general population (8). The gender distribution varies from one country to another (18, 19). However, it seems that severe forms are more frequent in men (20 Yang X). Senegal situation can be explained by the fact that the most imported cases are men who had gone abroad to look for work. It happens that some men could transmit the disease to several co-spouses. Adults are the most affected. Similar results have been observed in China (21, 22) and Europe. Disparities in age and sex distribution in the populations of Asia, Europe, America, and Africa make it difficult to compare countries (23).

Except the region of Diourbel, all other regions are in a border position; as such, they are maritime, airport or road gateway. The Diourbel region was chosen because several nationals of this region emigrate to Italy, Spain or the United States to work there.

The Health Districts affected were among the 45 out of 78 under special surveillance by the alert committee because their high-risk status (24). This illustrates Senegal preparedness in fighting Covid-19.

Containment requires a gradual implementation of measures according to the phase of the epidemic (6). The commitment of the GOS is an important success factor. A mix of suppression and mitigation measures have been set, some targeting the general population and other populations at risk (25). The particularity of the measures is that they were intelligent and adapted to the Senegalese context (26, 27). Indeed, the adaptation of measures to the local context is a success factor for Covid-19.

By prohibiting movement between regions, by imposing a night curfew, and establishing the COB time at 3 p.m. instead of 5 p.m., Senegal has chosen less restrictive measures while maintaining proper economic activity. The hospitalization of cases, the use of hotels to isolate contact subjects for 14 days (28) combined with targeted quarantine measures for families or villages in rural areas are effective (25) and appropriate mitigation measures. All of this was facilitated at regional level by Governors involvement from the beginning of the process through the decentralized management committees. The borders closure and the suspension of air and sea lines seem to be working as no imported case has been reported since April 4th, 2020.

Social distance seems difficult to organize in Senegal (29). Full containment requires housing and economic resources for a decent daily life. For many African households living in urban areas, cramped housing conditions and precarious economic conditions make it difficult to adopt these measures consequently implementing such measures would be a failure because they are not adapted to the context.

However, if most of the measurements to date do not suffer from dispute, certain measures such as the prohibition of prayer in mosques in a country where more than 95% of the population is Muslim can arise problems of acceptability particularly during the upcoming month of Ramadan (starting the last week of April) in Senegal and where the people are called to make collective prayers in the evening.

Conclusion

Analysis of data from the first month of the Covid-19 pandemic management in Senegal showed that preparedness activities resulted in an early detection of cases. Thus, GOS measures, which were gradual and adapted to the local context, made it possible to contain the pandemic during the first month. However, there is a need to strengthen surveillance following appearance of community-based cases and to readjust strategies for containing the pandemic during the second month. Indeed, the increase in the number of cases will have an impact on the quality of care based on the high significance of the morbidity burden: 27% of Senegalese are hypertensive and 3% have diabetes (30).

Declarations

- **Ethics approval and consent to participate**

These data come from the Direction of Prevention which coordinates the collection of data on the pandemic in Covid-19 in Senegal

- **Consent for publication**

This article is published with the agreement of the Prevention Department at the level of the Ministry of Health. The PD provides secretariat in the National Committee for the Management of Epidemics. At the operational level, detection, investigation and follow-up of contacts are carried out by the Surveillance Division of the DP. The databases are centralized within this division.

- **Availability of data and material**

The data used to make the analyzes which in this article are available at the level of the Direction of Prevention at the level of the Ministry of Health

- **Competing interests**

The authors declare no conflict of interest

- **Funding**

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- **Authors' contributions**

Boly Diop :He participated in the adaptation of the collection tools. He participated in the coordination of data collection. He wrote the first draft of the article.

El Hadj Mamadou Ndiaye: He participated in the adaptation of the collection tools. He participated in the coordination of data collection. He participated in the writing of the article

Mamadou Ndiaye: He participated in the adaptation of the collection tools. He participated in the coordination of data collection. He participated in the writing of the article

Jean Pierre Diallo: He participated in the adaptation of the collection tools. He participated in the coordination of data collection. He participated in the writing of the article

Fatou Bintou Diongue: He participated in the realization of statistical analysis

Adama Faye: He participated in the realization of statistical analysis

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Tables

Table 1: Distribution of cases tested positive for COVI-19 in Senegal according to individual characteristics (N = 195)

	n	%
Sex		
Female	105	53,8
Male	90	46,2
Region		
Dakar	138	70,8
Diourbel	26	13,3
Thiès	24	12,3
Saint-Louis	3	01,5
Ziguinchor	3	01,5
Fatick	1	00,6
Origin of case		
Imported case	77	39,5
Contact case	108	55,4
Community case	10	05,1
Outcome of the disease		
Healed	55	28,2
Under treatment	139	71,3
Death	1	00,5
Age (years)		
0-9 years	17	08,7
10-19 years	17	08,7
20-59 years	135	69,2
60 years and +	21	10,8
NP	5	02,6

Table 2: Government of Senegal measures in the context of Covid-19

Measures	Date
Self-isolation on return from abroad	27/01/2020
case-based self-isolation	02/03/2020
Barrier measures	10/02/2020
Ban on gatherings	14/03/2020
Closure of schools and universities	14/03/2020
border closure	20/03/2020
Quarantine	18/03/2020
State of health emergency	23/03/2020
Curfew	23/03/2020
Market closure	23/03/2020
Mosques closure	23/03/2020

Figures

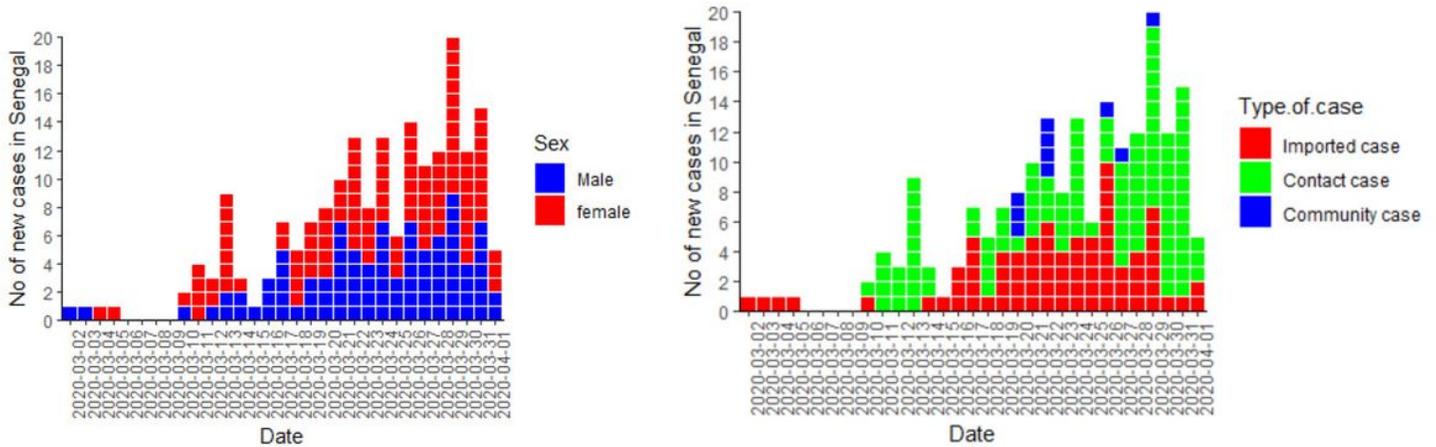


Figure 1

Epidemic curve of covid-19 patients by sex. Epidemic curve of covid-19 patients by type of case

Figure 2 was omitted by the authors in this version of the paper.

Figure 2

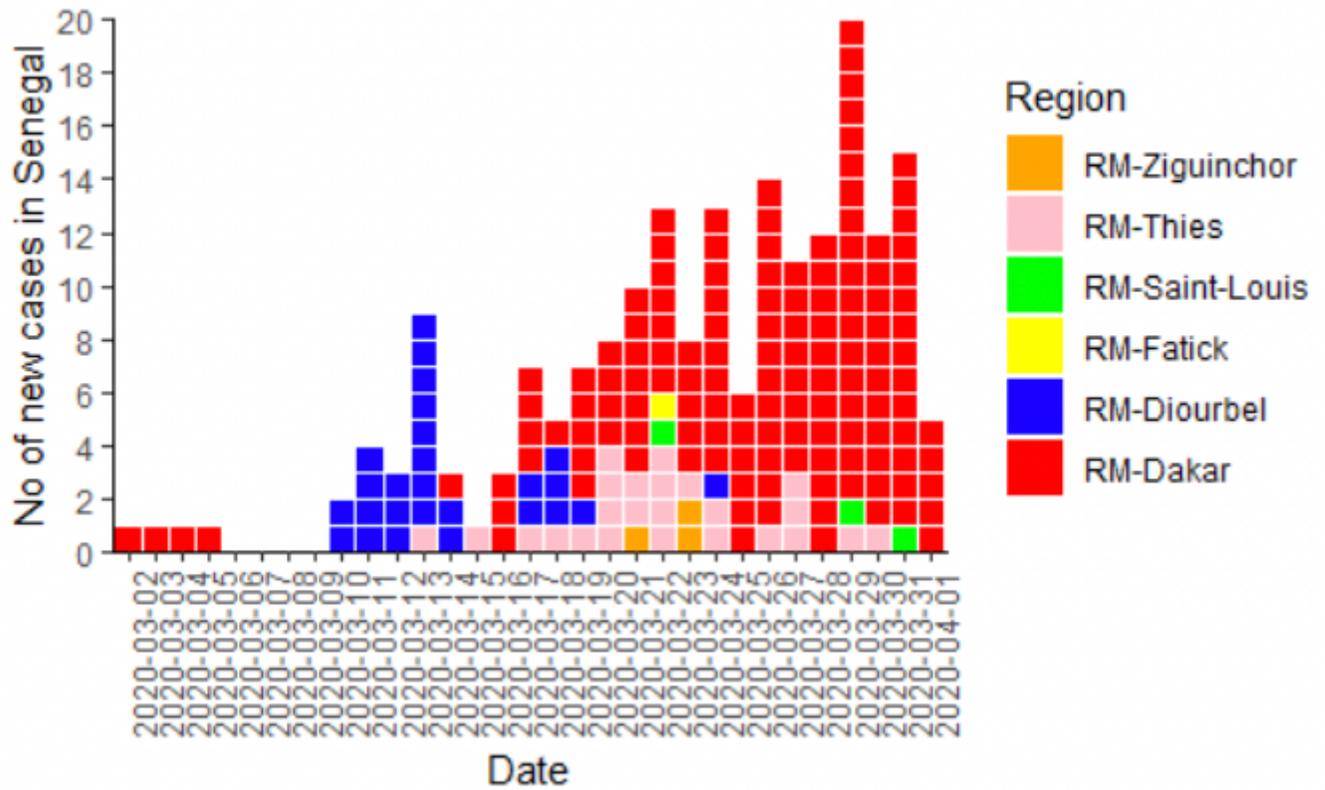


Figure 4

epidemic curve of covid-19 patients by type of case

Supplementary Files

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