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Evaluation by RT-PCR of the Nasopharyngal Carriage Rate of SARS-CoV-2 Among Travelers Leaving the Country (Senegal)

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ABSTRACT

***Introduction**: The new SARS-CoV-2 coronavirus, discovered at the end of 2019, led to a pandemic as early as March 2020, affecting all areas of life, and travelers were not spared. The objective of this work was to estimate the frequency of nasopharyngeal carriage of SARS-CoV-2 by RT-PCR in travelers leaving the country (Senegal) and to determine the factors associated with this carriage.*

***Materials and Methods**: This was a cross-sectional study conducted at the National Public Health Laboratory (LNSP) of Thiès from December 2020 to February 2021. It included 500 travelers selected by the convenience non-random sampling method. Demographic and clinical data were collected using a standardized form. The RT-PCR test was performed using nasopharyngeal samples.*

***Results**: 480 patients were declared asymptomatic. The RT-PCR positivity rate was 6% overall. The majority of patients came from the Thiès region (80%).The average age of the patients was 39 years old. The majority of patients (60%) were male. 2% of travelers had at least one medical comorbidity (diabetes, asthma and / or obesity). The most frequent clinical signs were cold 10% and cough 3.3%.*

***Conclusion**: Our results showed a low proportion of COVID-19 positive travelers. These patients were mainly elderly, male and asymptomatic.*

Keywords

Coronavirus, Sars-CoV-2, RT-PCR, LNSP, Senegal.

Introduction

Since December 2019, the whole world has been living at the rate of a serious health crisis caused by the emergence of a new coronavirus, officially known as SARS-CoV-2 [1]. The disease linked to this virus is COVID-19 [2]. COVID-19 has quickly spread around the world to become a global public health emergency [3]. The World Health Organization (WHO) designated COVID-19 as a pandemic on March 11, 2020 [4]. COVID-19 affects the world's population and affects all areas of human life, and travelers have not been spared. Until now, initial surveillance has mostly focused on symptomatic and / or critically ill patients. Little is known about the extent and fraction of asymptomatic infections that do not require medical attention, and 80% of cases are asymptomatic [5]. In order to limit transmission and reduce morbidity and mortality due to COVID-19, the measure taken by actors in the transport sector is screening for SARS-CoV-2 in international travelers before travel, at points of entry or after the trip [6].

It is in this context that our study was placed, the general objective of which was to assess the rate of nasopharyngeal carriage by RT-PCR of SARS-CoV-2 in travelers leaving the country (Senegal) and to determine the factors associated with this carriage.

Materials and Methods

Type of study, period and framework of study

This was a cross-sectional study conducted at the National Public Health Laboratory (LNSP) from December 12, 2020 to February 19, 2021 in the city of Thiès (Senegal). It included 500 travelers selected by the convenience non-random sampling method. Travelers who refused to participate in the study were not included. A telephone number was requested from travelers to ensure the results were returned. A written result or electronic version was sent to the traveler the same day or the next morning. In the event of a positive result, explanations of the disease were given to travelers and their care was provided by the clinical service of the 10th district of Thiès.

Ethical issues

Verbal consent was obtained from each participant before being registered and the anonymity of the information collected was ensured during the survey. The only criterion for non-inclusion was the traveler's opposition to the collection and analysis of his data.

Gathering, processing and data analysis

Epidemiological (age, sex and origin) and clinical data (signs and comorbidities) were recorded on a standardized data collection sheet. The samples for carrying out the RT-PCR test were obtained by nasopharyngeal sampling procedure, using a swab discharged into a virus transport medium of the Nest® type. Total nucleic acids (RNAs) were extracted using the Da An Gene kit and amplified using the mix of the TaqPath kit and the Applied Biosystems ™ 7500 Fast Dx Instrument, according to LNSP procedures.

Statistical analysis

Quantitative variables were presented as mean, median and range. The categorical variables were described on the basis of the frequencies and numbers of the different modalities. Univariate analysis was performed by Student t test for quantitative variables, or Pearson's χ^2 test for categorical variables. A p-value ≤ 0.05 was considered significant. The analyses were carried out under R-studio.

Results

From December 02, 2020 to February 19, 2021, 500 outgoing travelers from different locations across the country were received at the LNSP. The evolution of the number of consultants per day is given in figure 1. There was a peak in attendance between January 14 and February 16, 2020. The sex ratio (male / female) of travelers was 2.60, the median age 41 years [2–91]. The travelers lived in the Department of Thiès in 85.6% of cases (428/500). Out of the 500 travelers included in the study, 480 were declared asymptomatic and 493 did not present with predisposing conditions. The RT-PCR positivity rate was 6% overall (30/500). The Ct values as a function of the patients are given in figure 2 and vary from 16 to 36.

Out of 30 positive samples, 18 were male (60%) and 12 female (40%). the sex ratio (1.5) was slightly in favor of men and the difference was not significant (p-value = 0.31). The age of RT-PCR positive travelers ranged from 04 to 71 years and had a mean value of 39 years. The difference between these two classes was not significant. Patients of various origins were identified particularly from Thiès with 80%, Louga (10%), Saint Louis (07%) and Dakar (03%). Among the two most frequently encountered regions (Thiès vs Louga), the difference was not significant (Table 1).

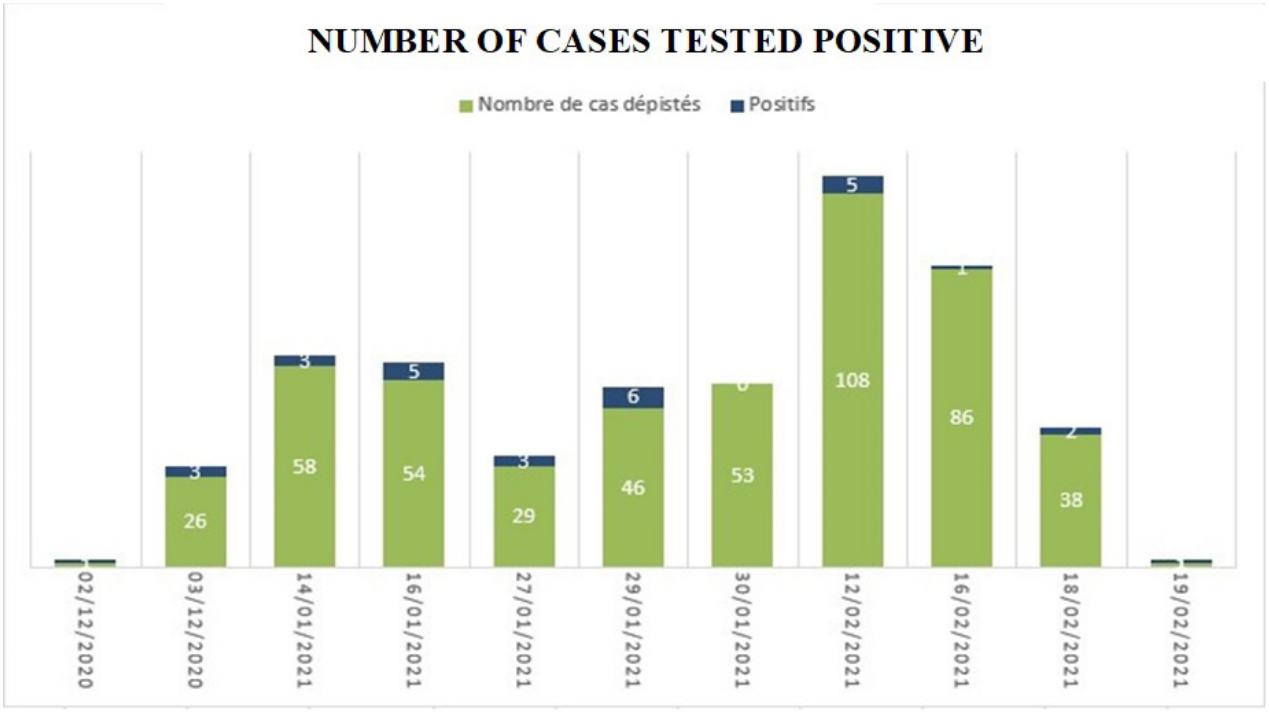

Figure 1: Number of outgoing travelers tested and positive.

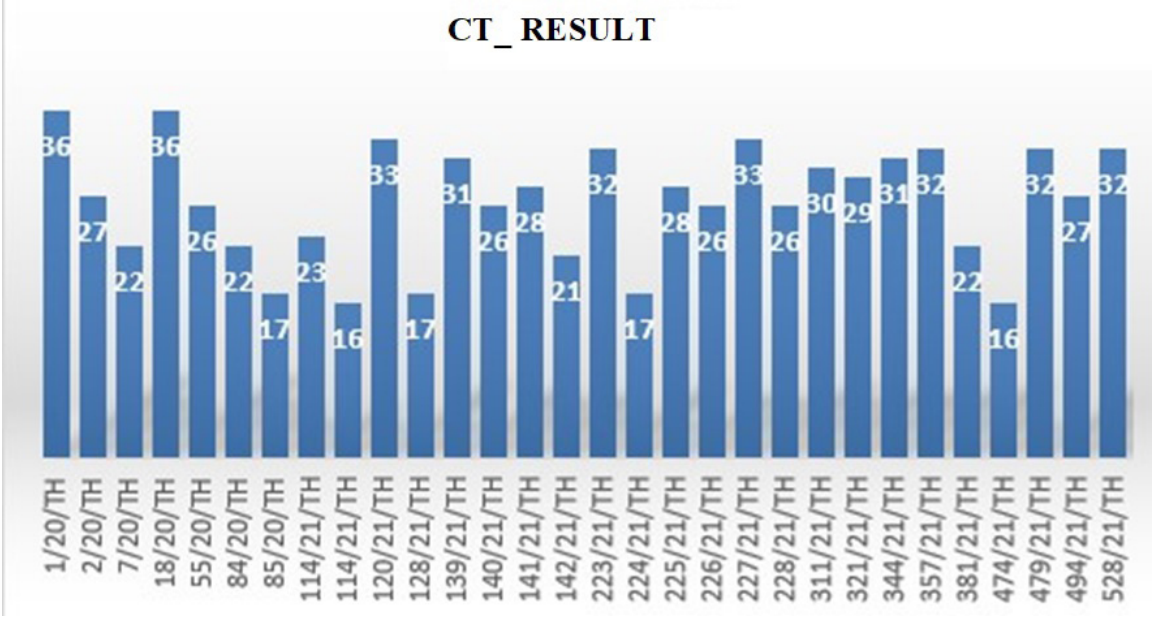

Figure 2: Ct values as a function of sick individuals.

Table 1: Positive travelers demographics.

Characteristics	Frequencies (n=30)	Percentages (%)
Sex		
Masculine	18	60
Feminine	12	40
Age in years		
04-30	08	27
30-71	22	73
Origins		
Thies	24	80
Louga	03	10
Saint Louis	02	07
Dakar	01	03
Total	**30**	**100**

The clinical signs observed are described in Table II. The time between the onset of signs and consultation was longer in the population with a positive RT-PCR (3.2 days). Cold was present in 10% of cases (8/30), cough in 3.3% (2/30) of RT-PCR positive cases. Regarding comorbidities, 2% (n = 500) of travelers had at least one medical comorbidity. The most common comorbidities encountered in RT-PCR positive travelers were diabetes (3.3%), asthma (3.3%) and obesity (3.3%).

Table 2: Symptoms and comorbidities declared during the screening consultation.

	Total N=500 (%)	RT-PCR + 30 (%)
Symptoms		
Cough	1.0 (0.2)	1.0 (3.3)
Cold	8.0 (1.6)	3.0 (10)
Fever	2.0 (0.4)	0.0 (0.0)
Predisposing Affections		
Asthma	3.0 (0.6)	1.0 (3.3)
Diabetes	2.0 (0.4)	1.0 (3.3)
Obesity	2.0 (0.4	1.0 (3.3)
Allergy	3.0 (0.6)	1.0 (3.3)

Discussion

During our study, we observed a peak in attendance between January 14 and February 16, 2021. This peak could be explained by the fact that travelers on holiday during Christmas celebrations in Senegal returned during this period. The majority of tests performed on travelers came back negative (94%). The average time between exposure to SARS-CoV-2 and the onset of symptoms can vary from 1 to 14 days. In most people, the virus becomes detectable in the upper respiratory tract about 1 to 3 days before the onset of symptoms and for several days to several weeks after the symptomatic period [7]. Negative results in tests for SARS-CoV-2 can generate a false sense of security for both travelers and the national authorities of the country of destination of travelers, and could lead to less diligent compliance with hygiene rules with hands, wearing personal protective equipment, etc. As a result, the majority of Western countries require tests with a validity period of less than 48 hours to 72 hours before departure.

Our results showed a percentage of travelers with a low positive RT-PCR (6%) compared to the results of Western countries for example the study which reported in its study made on traveler's higher percentages than ours 50 to 60%. Our results could be explained by the fact that the Senegalese population is mainly made up of young people, unlike populations in Western countries. Our work showed that 73% of travelers who tested positive for SARS-CoV-2 were between 30 and 71 years old and the average age was 39 years old. However, the average age of our study population was low compared to those found in American and European studies [8]. Studies and reports covering the general population support that age is a significant risk factor for SARS-CoV-2 disease. Our results were in agreement with those of Huang and collaborators [9] who, studying the epidemiology of the Chinese population, found a median value between 35 and 58. The age above 50 years appeared to be strongly associated with

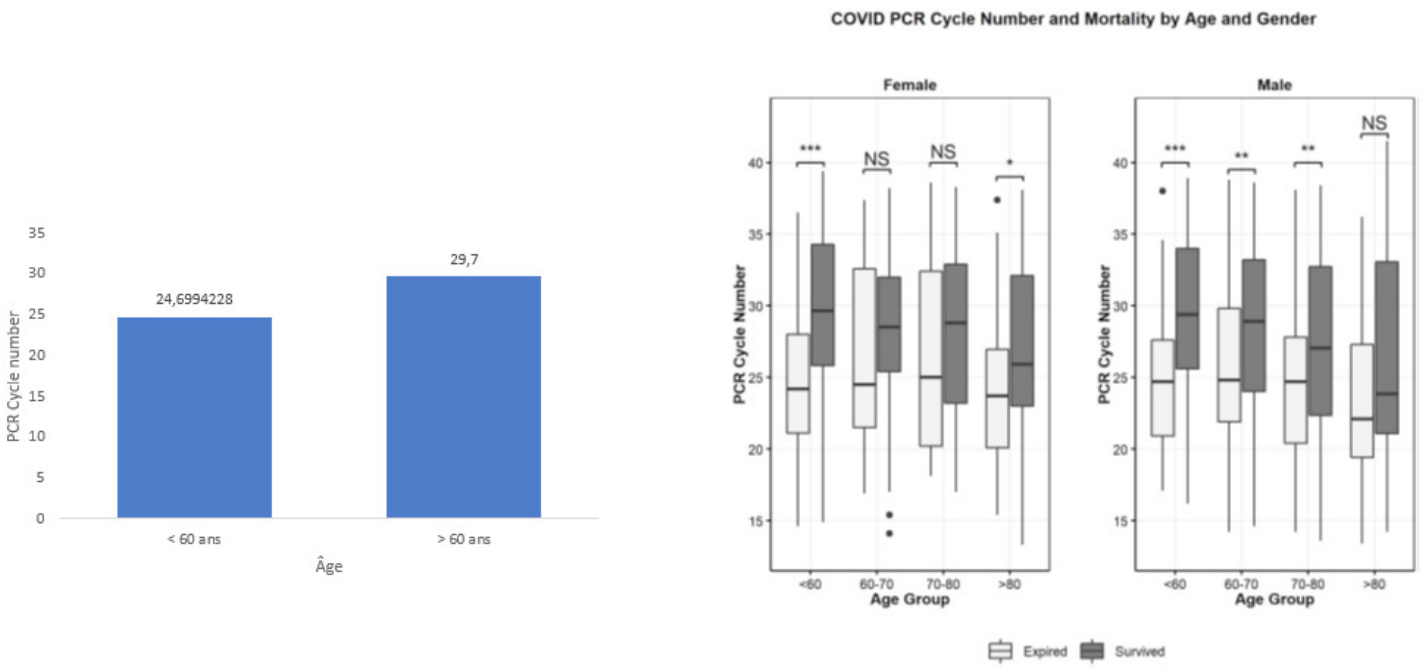

Table 3: Comparative study of CT with the literature.

the occurrence of SARS-CoV-2 according to Plaçais & Richier [10]. This could be explained by the fact that: the older you get, the fewer new lymphocytes are produced, and they are needed to fight a new infection like SARS-CoV-2.

Several series report a predominance of the male sex in patients, as in our study. Our results are similar to those in China of [11], which reported that the majority of patients (over 60%) were male. In our context, this male predominance could reflect the differences in social activities between the two sexes. In the African region, man being more mobile and generally in contact with a higher number of people than women, he is exposed to a higher risk of contamination than women, who are more often confined to the role of housewife, and therefore sedentary. In addition, according to the literature, the low rate of COVID-19 in women could be explained by their reduced susceptibility to viral infections [12]. In our study, there were no serious cases, nor death.

Our results showed that travelers with a positive RT-PCR test lived in the Thiès region in 80% of cases. This is explained by the fact that Thiès is a crossroads, and the concentration of people is high. Indeed, according to data from the EpiCov survey, people living in cramped or overcrowded housing are 2.5 times more likely to have tested positive for COVID-19. Our results were in agreement with those of [13].

In our study, the travelers concerned mostly had mild forms of the disease (480/500). The clinical signs reported in RT-PCR positive travelers (cold 3.3% and cough 10%) were similar to those reported in the literature. Among the travelers who had a negative RT-PCR, 5% presented suspect clinical signs (cold, cough…). COVID-19 primarily affects the respiratory tract. The epidemiological impact of these asymptomatic forms is not yet clear, but several cases of contamination during the incubation period or from asymptomatic patients have been reported. In our series, we noted cases of comorbidities (asthma, diabetes and obesity) in RT-PCR positive travelers. Our results corroborate data from the literature such as those of [14]. Indeed, the presence of pre-existing comorbidities constitutes a risk factor for infection with COVID-19. However, our studies carried out on small numbers (500) do not make it possible to conclude as to the risk incurred by patients with co-morbidities during the SARS-CoV-2 pandemic.

The study by choudhuri et al in 2020 showed a correlation between the severity of the disease and low Ct values in symptomatic hospitalized patients. This is not the case in our study. To date, we have not found any study demonstrating this association in non-hospitalized positive subjects [15].

Nasopharyngeal RT-PCR has a sensitivity limited to about 70%. There is probably an underestimation of the cases tested. Another limitation was the lack of detection of other respiratory viruses with Sars-CoV-2 by multiplex RT-PCR, especially in negative patients with clinical signs.

Conclusion

Our results showed a low proportion of travelers leaving the country positive for COVID-19. However, these asymptomatic positive patients confirm the need to strengthen prevention and screening. Our study does not show an association between low Ct values and a severity of illness in asymptomatic subjects, unlike hospitalized and therefore symptomatic patients. A study on a larger positive sample is necessary for a better control of the biological, epidemiological and clinical aspects. National

recommendations on the interpretation of the obtained Ct values would also be beneficial.

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