

POSITIVITY OF TESTS FOR COVID-19 USING THE RT-PCR METHOD IN THE FEDERAL DISTRICT, FROM MARCH 2020 TO JUNE 2022

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Abstract: An effective and timely way to monitor the COVID-19 epidemic is to calculate the proportion of positive Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test results for SARS-CoV2 over time. This indicator is called positivity and is a predictor of trends in the covid-19 epidemic. High positivity may indicate lack of control of the epidemic. The objective of this study was to evaluate the electronic medical record database of the Health Department of the Federal District (SES-DF) regarding the quality, timeliness and proportion of positivity of RT-PCR tests for SARS-CoV-2 in the Federal District (DF). A descriptive cross-sectional study was carried out, with the evaluation of secondary data from patients who underwent RT-PCR tests in the public network of the Federal District, between March 2020 and June 2022. It was identified that during the analysis period, 472,281 RT PCR tests for SARS-CoV-2, with 141,310 (29.2%) positive tests. The median positivity over the months was 28%, reaching the maximum value in July 2020 (43%) and the minimum value in April 2022 (0.6%). The positivity results found in the DF showed a better epidemiological situation when compared to the national situation. System evaluation showed excellent data quality and timeliness. The analysis of the positivity indicator was fundamental for the management of economic resources, organization of management levels and helped in the decision-making of assistance measures. From an epidemiological point of view, it proved to be an important indicator of the epidemic.

Keywords: Covid-19; Polymerase Chain Reaction Via Reverse Transcriptase, epidemiology.

INTRODUCTION

Covid-19 is a serious viral respiratory disease caused by SARS-CoV-2, which

achieved worldwide notoriety in 2020 due to its rapid spread, extension, morbidity, mortality and the need for control and prevention measures, such as social distancing.¹

The use of accurate testing is essential for controlling the spread of the covid-19 pandemic. However, it must be noted that the success of screening for the disease depends on the accuracy of the tests and the appropriate time for diagnosis.²

Standard confirmation of acute SARS-CoV-2 infections is based on the detection of unique viral sequences in upper and lower respiratory tract secretion samples. RT-PCR amplifies the genetic material of the virus for later identification³.

The high positivity of the tests may indicate a lack of control of the epidemic process. This occurs when the indication for the test is appropriate for the case, in patients with a compatible clinical and epidemiological picture, and the collection is timely. Otherwise, high positivity could be a result of inadequate volume of tests performed or inability to test, where only the most severe cases are tested, resulting in high positivity⁴. The analysis of the positivity indicator over time is extremely important, when used in conjunction with other morbidity and mortality indicators, to estimate the progress or reduction of the epidemic in the territory.

It is important to consider the recent increase in knowledge about the direct impact of different viral loads on test results, diagnostic accuracy and false negative results.^{5,6}. In addition, it must be noted that positivity depends on the existence of viruses in sufficient quantity to be detected, which may vary according to the test location, sampling methods and time⁷.

In most individuals with symptomatic covid-19, the RT-PCR result is detectable on the first day of onset of symptoms, with a peak in the first week. The decline is observed

from the third week onwards, becoming undetectable⁸.

The collection of cases for the local covid-19 registration system in the DF was carried out through notifications of flu syndrome cases in the e-SUS-Notifica system, SARS cases and deaths in the Sivep-flu system or through lists of patients with positive tests for covid-19 carried out in private laboratories in the DF. Tests processed in the public network had results reported in the electronic medical record system called TrakCare.

This analysis had the general objective of evaluating the proportion of positivity of RT-PCR tests for SARS-CoV-2 in the public network of the DF between March 2020 and June 2022. The evaluation of the quality of the database was also studied, and the diagnostic opportunity.

METHODS

This is a descriptive cross-sectional study, with evaluation of secondary data from the TrakCare electronic medical records system of the State Department of Health of the Federal District. All patients who underwent the SARS-Cov-2 RT-PCR test by the Central Public Health Laboratory (LACEN) between March 2020 and June 2022 were included. The laboratory confirmation criteria defined in the Ministry of Health protocol were adopted. Health (MS)9.

To assess the quality and diagnostic opportunity of data from the electronic medical record information system, the CDC10 guide was adopted as a theoretical framework.

The 'data quality' attribute was evaluated based on the analysis of completeness, consistency of essential fields and non-duplication of sample records. These quality dimensions were defined following the parameters of Lima et al, 2009¹¹. The results

were categorized from the average defined as: excellent, when greater than or equal to 90.0%; good, between 70.0 and 89.9%; regular, between 50.0 and 69.9%; and bad, when less than 50.0%. Duplication was evaluated using the sample number field. A duplicate record was considered when the sample number was repeated in the system.

Regarding the 'opportunity', the time of release of the exam was evaluated. An examination with a release date of the result within 2 days of the collection date was considered opportune.

Positivity was analyzed through the frequency of tests with a detectable result in RT-PCR for SARS-CoV2.

Analyzes were performed with Microsoft® Excel® 2016 and Epiinfo 7.2.

RESULTS AND DISCUSSION

Analyzes of the quality of the electronic medical record database showed 100% completeness of the fields sample, date of collection and date of birth and no duplication in the sample number. Only 4 records had a collection date ranging from 2012 to 2018, 724 had future dates of birth and 2 had outdated dates, resulting in less than 1% inconsistency in both variables. Such findings allowed classifying the quality of the bank as excellent.

Between March 2020 and June 2022, 472,281 tests were carried out in the public network of the DF, with 141,310 (29.9%) cases of covid-19 confirmed by RT-PCR.

The median positivity of the samples in the DF was 28% (range varying between 0.6% and 43.0%) throughout this historical series, showing two major peaks, in the months of July 2020, when the positivity reached 43, 0%, and March 2021, with 40.4% (Figure 1). It must be noted that the total number of tests carried out in these months was also the highest in the series.

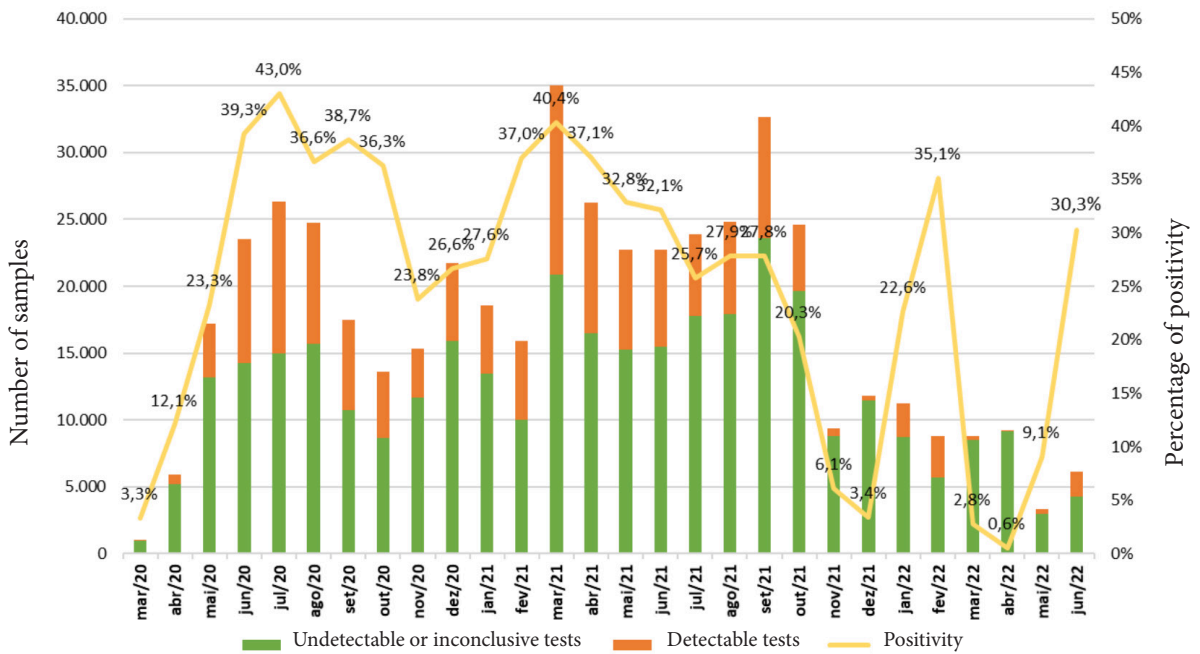


Figure 1. Number of cases and positivity per month between the years 2020 to 2022, in the Federal District.

Fonte: TrakCare. Dados extraídos em 13/07/2022.

According to World Health Organization¹, a positivity rate of less than 5% is an indicator that the epidemic is under control. In Brazil, from March 2020 to June 2022, the monitoring of positivity by Fundação Oswaldo Cruz, through Monitoracovid, showed values between 13% and 58%⁴.

Arlindo et al, 2021¹², showed that screening results for pregnant women in Rio Grande do Sul showed positivity of 12%. Another study among health professionals residing in São Paulo showed positivity of 21%¹³. Comparing the same period as the previous study, the DF had a positivity of 37% in the general population and Brazil, 45%⁴. This suggests that RT-PCR testing in the DF may have been low, underestimating the real scenario, or the proportion of cases in the DF was lower when compared to Brazil.

Previous studies have established that, in COVID-19, the viral load in the upper respiratory tract typically peaks in the

prodromal period, 1 to 3 days before the onset of symptoms⁸. Active replication of SARS-CoV-2 in the throat occurs during the first 5 days after the onset of symptoms and declines, ceasing to become positive around the 10th to 11th day¹⁴. Moura et al¹⁵ showed that 64.8% of the positive cases had the test performed in a timely manner. The time between the onset of symptoms and collection, when performed between 3 and 7 days after symptoms, is essential to avoid false-negative results.

False negative results can be obtained after the loss of this opportune time for sample collection⁶. The present study evaluated samples received by all notifying laboratories in the DF. It was not possible to assess the timeliness of sample collection, but most tests were processed using the RT-PCR method. This limitation brings a bias, as the opportunity for collection could influence a greater positivity of the samples.

The proportion of positive results found in this study reflects the positivity found in Monitoracovid. Curves with a similar pattern, despite the smaller percentages and mismatched peaks, demonstrate a better epidemiological situation in the DF when compared to the national one (Figure 2).

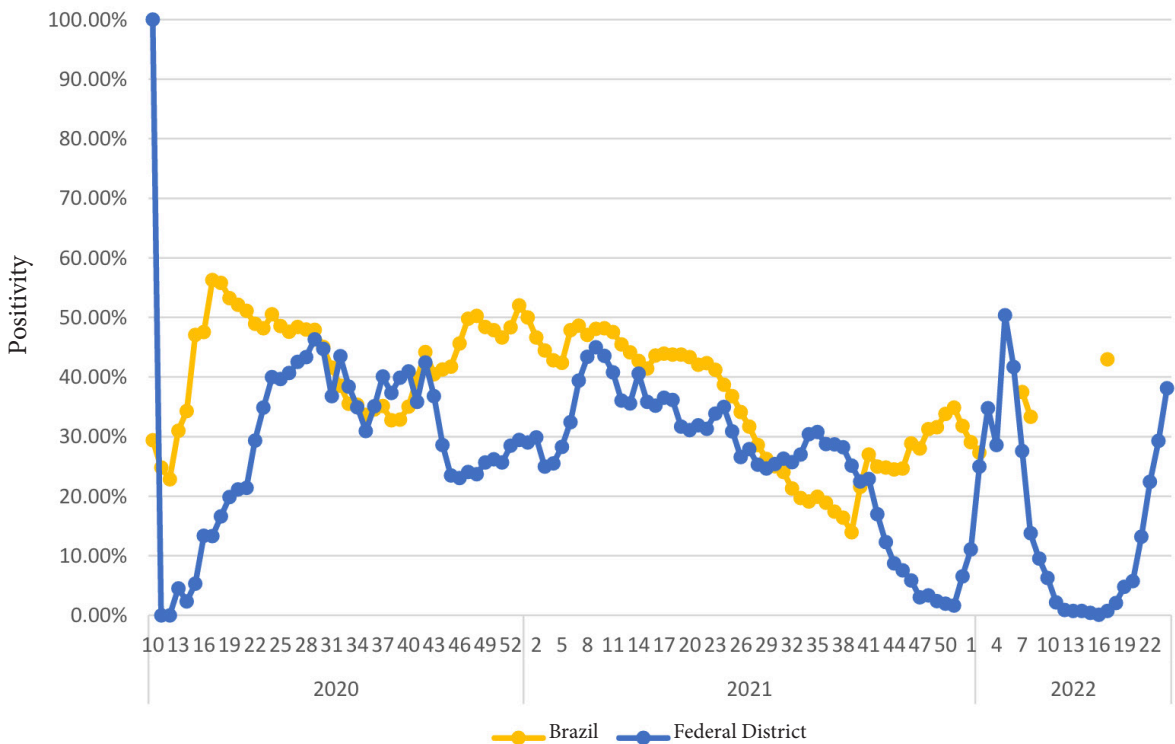
The temporal variation of detectable RT-PCR tests in Brazil, mostly converges with the peaks of cases in the Federal District, except for the year 2022, in which there is a reduction in diagnostic confirmation by RT-PCR (Figure 3).

The increase or decrease in the number of cases or deaths from covid-19 may be the result of the actual variation in people infected by the virus in the population or the testing capacity of the health system⁴. When applied properly and in a timely manner,

the tests can identify population groups and priority regions for actions to control and mitigate the epidemic⁴, with a decrease or intensification of measures.

The time to release the result in the public network of the DF, used to measure the opportunity, ranged between 1.1 and 8.4 days, with a mean of 2.1 days and a median of 1.4 days (with a minimum interval of 1.1 and a maximum of 8.4 days), as shown in Figure 4.

Lima et al showed that, on average, public laboratories took 3 days to release results and 14 days in periods of high demand¹⁶. Moura et al showed that 64.8% of the positive cases had the test performed in a timely manner, corroborating the diagnostic opportunity of covid-19 in the public network of the DF with 80.53%¹⁵.



* The information on the Brazil component is no longer fed to the system as often as necessary, making it impossible to compare it in full temporality.

Figure 2. Positivity per month between the years 2020 and 2021, in Brazil and the Federal District.

Source: TrakCare and Monitoracovid-19/FioCruz. Data extracted on 07/13/2022.

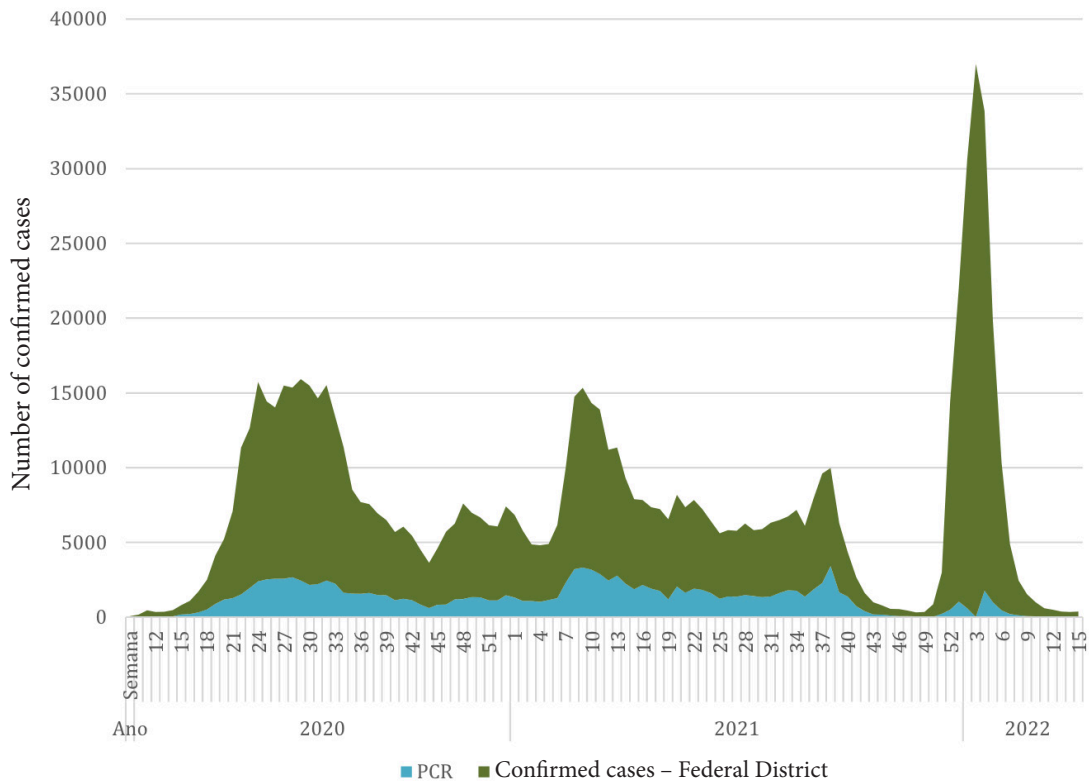


Figure 3. Number of confirmed cases and detectable RT-PCR results in samples processed in the public network, per month, between the years 2020 to 2022, in the Federal District.

Source: TrakCare and Info Saúde DF/Covid-19. Data extracted on 07/13/2022.

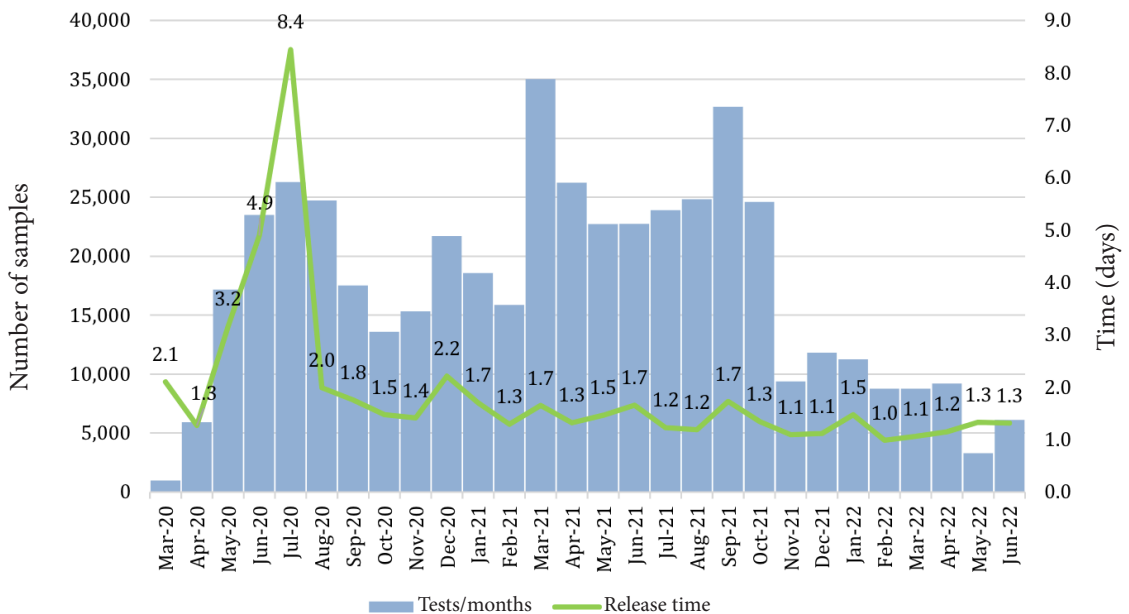


Figure 4. Number of samples and release time of RT-PCR results processed in the public network, per month, between the years 2020 to 2022, in the Federal District.

Source: TrakCare. Data extracted on 07/13/2022.

It is important to point out that, in the month of July 2020, the results of the public network had the longest interval for release (8.44 days).

The time to release the result can contribute to the delay in establishing the patient's isolation, which contributes to greater transmission and an increase in the number of cases.

CONCLUSION AND RECOMMENDATIONS

The evaluation of test results in the electronic medical record showed excellent quality and timeliness of information.

Although this study did not aim to approach the accuracy of the RT-PCR test, it is necessary to include this discussion, as the result of the test and, consequently, the positivity is limited by the quality of the sample, place and method of biological collection, determination of the beginning of symptoms and methods for laboratory detection of the virus⁸.

Among others, epidemiology is a science that makes it possible to assess the impacts on the health of the population through studies of the health situation, surveillance and investigations, transforming data into prevention and control actions.¹⁷. This way, knowing the positivity of the samples for the detection of SARS-CoV2 among the population of the DF was fundamental for the management of financial resources, organization of management levels and aid in decision-making. From an epidemiological point of view, the frequency of positivity is an important tool to contain, slow down and reduce covid-19, establishing itself as an important indicator of the epidemic.

Dedication: Our thanks to all professionals in the public network who carried out the collection of thousands of exams, in particular the servers of Lacen DF for the excellent work provided to the population.

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