

Increase SARS-CoV-2 infection in a border region after Brazil national holidays

Aumento da infecção de SARS-CoV-2 em uma região de fronteira após feriados nacionais no Brasil

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ABSTRACT

In recent years, the emergence and resurgence of infectious diseases have raised many questions about the role of epidemiological surveillance and understanding the patterns of infections can help in

preventing and combating the disease. The objectives of this study were to report the increase in the number of positive cases in the border municipality of Foz do Iguaçu-PR and region, before and after national holidays in Brazil and its implications for public health. After the holidays, the average number of tests remains, and an increase in the number of positive cases is observed between days 5th, 6th, and 7th, 4.93% on Corpus Christi, 6.44% on Mother's Day, 4.20% on Father's Day, 10.43% on Independence Day and 14.49% on Our Lady of Aparecida's Day. The data can be useful, assisting hospital managers and health teams in the planning, and coordination of hospitals, since a sudden increase in the number of contaminated patients can generate a saturation in care stations and hospital units. This research demonstrates that national holidays can influence the increase in positive cases for SARS-CoV-2, and there are indications for greater contamination over long holidays.

Keywords: Virus, COVID-19, pandemic, viral dissemination, infection.

RESUMO

Nos últimos anos, o surgimento e o ressurgimento de doenças infecciosas têm levantado muitas questões sobre o papel da vigilância epidemiológica, e a compreensão dos padrões de infecções pode ajudar na prevenção e combate às doenças. Os objetivos deste estudo foram relatar o aumento do número de casos positivos no município fronteiriço de Foz do Iguaçu-PR e região, antes e depois dos feriados nacionais no Brasil e suas implicações para a saúde pública. Após os feriados, a média de exames permanece, e observa-se um aumento no número de casos positivos entre o 5º, 6º e 7º dia, 4,93% no Corpus Christi, 6,44% no Dia das Mães, 4,20% no Dia dos Pais, 10,43% no Dia da Independência e 14,49% no Dia de Nossa Senhora Aparecida. Os dados podem ser úteis, auxiliando gestores hospitalares e equipes de saúde no planejamento e coordenação dos hospitais, uma vez que um aumento repentino no número de pacientes contaminados pode gerar uma saturação nos postos de atendimento e unidades hospitalares. Esta pesquisa demonstra que os feriados nacionais podem influenciar o aumento de casos positivos para SARS-CoV-2, e há indicações de maior contaminação durante feriados prolongados.

Palavras-chave: Vírus, COVID-19, pandemia, disseminação viral, infecção.

1 INTRODUCTION

Since February 25, 2020, when the first confirmed case of Coronavirus disease 2019 (COVID-19) occurred in Brazil, the country has recorded about 5.44 million cases and about 158 thousand deaths due to the disease^{1,2}.

In recent years, the emergence and re-emergence of infectious diseases, such as avian influenza (Influenza A H5N1) in 2003, SRAG in 2002/2003, Influenza A H1N1 in 2009, and Zika in 2015, have raised many questions about the role of surveillance epidemiological. Pandemics have occurred more frequently, and in 2018, World Health Organization (WHO) recognized the need to prepare in advance for the emergence of new pathogens, including, under the name "disease X", diseases still unknown with potential for international emergence in the list of priorities for research and development in the emergency context³.

The emergence of new diseases has impacts far beyond the cases and deaths they generate, they also create an ideal context that imposes on national public health systems the task of validating their health surveillance and assistance system in terms of the opportunity for early detection and the cascading response power⁴.

Countries have sought to apply the WHO recommendations for COVID-19 prevention such as regular hand cleaning; one meter distancing between people; avoid crowded places; wear a fabric mask if there is widespread community transmission and especially where physical distancing cannot be maintained; avoid touching eyes, nose and mouth; covering mouth and nose with bent elbow or tissue when cough or sneeze; stay home and self-isolate even with minor symptoms such as cough, headache, mild fever, until recover or if having a fever, cough and difficulty breathing, seek medical attention, but call by telephone in advance if possible and follow the directions of local health authority⁵.

On March 16, 2020, the closure of schools and events with above 50 peoples and lockdown measures were enforced by the Paraná state government for 2 weeks, and 2 weeks more starting on July 1⁶, restricting activities considered nonessential, such as shopping malls, department stores, street shops, street markets, beauty salons, and clinics, barbershops, gyms, clubs, bars, and nightclubs. On March 18, 2020, closure access to the bridge between the borders of Brazil and Paraguay was decreed⁷, and the population was asked to stay at home and socially isolate themselves to prevent being infected, as a containment measure.

The state of Paraná is subdivided into health regionals. The 9th Regional Health Department of Paraná State covers the cities of: Foz do Iguaçu (259.320 inhabitant), Itaipulândia (11.210 inhabitant), Matelândia (17.998 inhabitant), Medianeira (46.339 inhabitant), Missal (10.735 inhabitant), Ramilândia (4.465 inhabitant), Santa Terezinha de Itaipu (23.537 inhabitant), São Miguel do Iguaçu (27.536 inhabitant), Serranópolis do Iguaçu (4.509 inhabitant). Totaling a population of 405.649 inhabitants (Governo do Paraná, 2020), and has a contaminated rate of 3.167 per 100.000 inhabitants, the highest in the state of Paraná⁸.

From the beginning of the pandemic until September, the 9th Regional Health Department of Paraná State had 12.848 cases and a total of 165 deaths due to COVID-19⁸. According to Codeço et al.⁹, Foz do Iguaçu is a city prone to suffer aggravations in the health area related to the SARS-CoV-2 pandemic, due to its characteristics such as tourism, diversity, and being a three-border city. As a result, the surrounding cities end up feeling the impacts of a possible increase in cases and depletion of hospital beds, since Foz do Iguaçu is responsible for absorbing the most serious cases in the region, in addition to mass testing of the surrounding population. Schools and public places remain closed from

the date of the decree, but airports, bus stations, and tourist sites continue to serve the population normally.

In this context, the objectives of this study were to report the increase in the number of positive cases in the border municipality of Foz do Iguaçu and region, belonging to the 9th Regional Health Department of Paraná State, before and after national holidays in Brazil and its implications for public health.

2 MATERIAL AND METHODS

Data were collected from the 10 days before and after the holidays of May 10 (Mother's day), June 11 (Corpus Christi), August 9 (Father's day), September 7 (Brazil Independence day) and October 12 (Our Lady of Aparecida's day) (except weekends) of SARS-CoV-2 tests detection performed by the Three-Border Tropical Medicine Center (CMT), which performs tests for the entire macro-region of Foz do Iguaçu-PR, covering the 9th Regional Health Department of Paraná State, and represents the largest portion of the analyses performed for the detection of SARS-CoV-2 by rRT-PCR in the region.

3 RESULTS AND DISCUSSION

Figure 1 shows the cases in the 21 days valued. The five national holidays were centralized on the 11th day for better visualization and interpretation. During the first 10 days of the graph, the number of cases analyzed is fluctuating, mainly due to the difference in dates between the holidays, the first with few cases due to being close to the beginning of the local pandemic. After the holiday, the average number of tests remains ($\alpha > 0.05$) for Mother's Day, Father's Day, and Independence Day, indicating that there is no significant increase in the average population testing. For Corpus Christi and Our Lady of Aparecida's day, the average number of exams increases ($\alpha < 0.05$), indicating more post-holiday testing. Figure 2 shows the average of the SARS-CoV-2 positive results found in the 21 days of study.

Figure 1. Total cases were performed in the 21 days of study for each of the five holidays covered. The 11th day represents the day of the holiday.

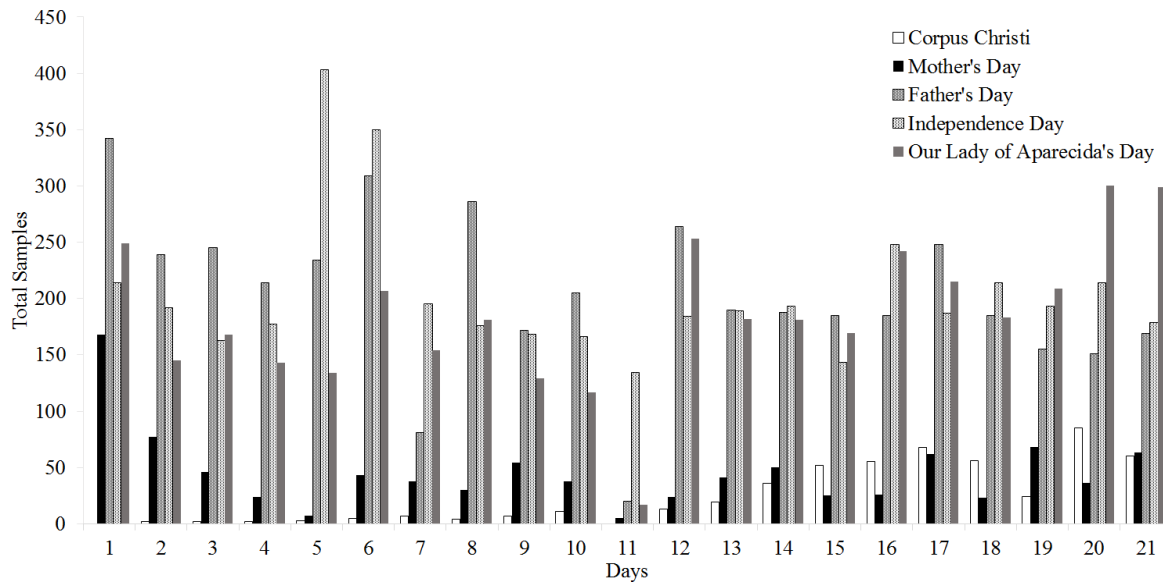


Figure 2. Average of the SARS-CoV-2 positive results were found in the 21 days of study. The 11th day represents the day of the holiday.

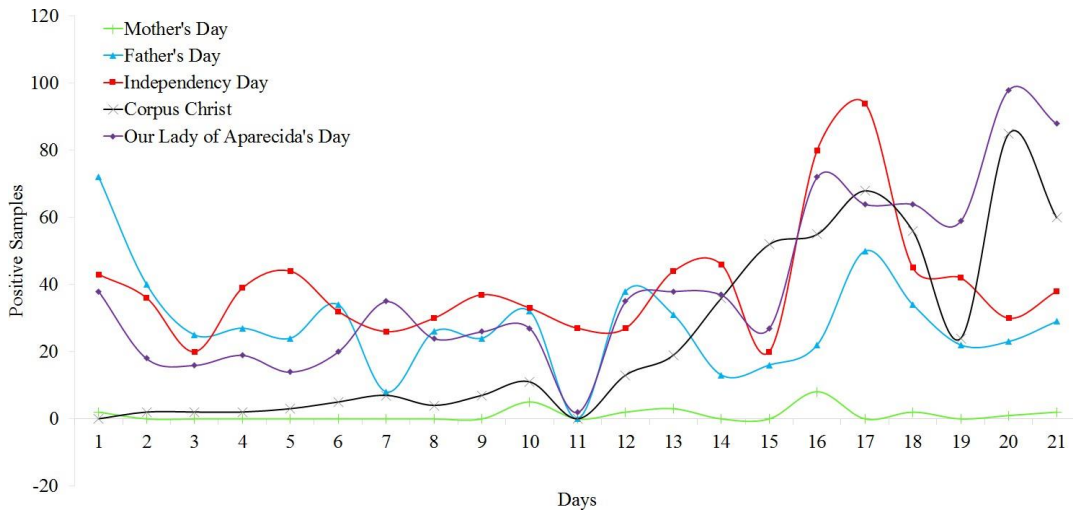
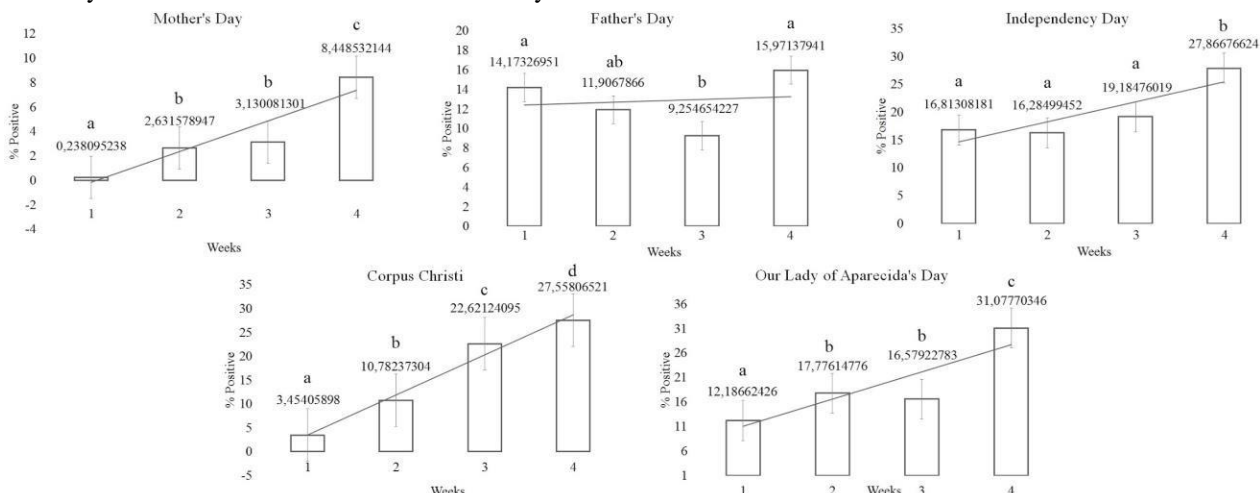


Figure 3 shows the percentage of positive results compared to the total number of tests performed during 10 days before (2 weeks), 5 days before (1 week), the holiday week (holiday and 5 days after), and 10 days after (1 week).

Figure 3. Percentage of positive results compared to the total number of tests performed during 10 days before and after the holidays. Letters indicate differences from Tukey's 95% test.



It is possible to identify that there was an increase in the number of positive cases between the 5th and 10th day after the five national holidays evaluated, indicating that during the holiday day and around there was a higher rate of spread of the virus among the population, less evident the average Father's day holiday tendency line of the days due to the "2 weeks before" block having a high rate of contaminates. However, when evaluating from "1 week before", all holidays had a significant increase in the positive cases for SARS-CoV-2, with an increase of 6.44% on Mother's day, 4.93% on Corpus Christi, 4.20% on Father's day, 10.43% in Independence day, and 14.49% on Our Lady of Aparecida's day ($\alpha < 0.05$).

The increase in the number of positive cases for SARS-CoV-2 may be related to regional restrictive measures, which were implemented at the beginning of the pandemic and loosened near the Mother's day holiday due to pressure from local trade. From that date, several other resumption measures were emerging, until normalizing all sectors in the week before the independence holiday. However, most of the measures were dispersed between the dates studied, not being a determining factor for the increase after the holiday.

The region of Foz do Iguaçu is known for being a tourist site, with the presence of artificial beaches, national parks, and the Iguaçu Falls, 3rd natural wonder of the world, being much sought after by people from all over the world. On Brazil's independence holiday, the visitation in the sights of Foz do Iguaçu was the largest since the beginning of the pandemic. On September 5, 6, and 7 (holiday), the Iguaçu Falls received 5,601 tourists from other regions and countries, which totals 76.84% of the total visitation, possibly assisting in the increase of cases in the following week, and may have had the spread of new viral strains in the local population.

Another factor that may have influenced the number of positive cases after the Corpus Christi holiday, Brazilian Independence, and Our Lady of Aparecida's day, is they are larger, totaling three days. The Mother's Day and Father's Day holidays were for two days. This combined with the family cultural characteristics of the regional population, which due to their diverse colonization, have agglomeration habits on commemorative dates and holidays, and many take advantage of the prolongation of the holiday to travel or see distant family members. This, together with the decrease in the adherence of the population, the measures of restriction and isolation, which we're already accustomed to the new routine and the presence of the virus, may have helped in the increase of infected cases.

The data found can be useful, assisting hospital managers and health teams in the planning, management of beds, and coordination of hospitals, since a sudden increase in the number of contaminated patients can generate a decrease in the availability of beds, saturation in care stations and hospital units.

This work has some limitations. The regional characteristics of the population may be determinant for the results, and the relationship between holiday and an increase in the number of positive cases for SARS-CoV-2 may be less evident in other regions. Another important point was the public policies applied, decrees, and restrictions, which can indirectly contribute to the results found. The replication of this work in other regions can help to better understand the spread patterns of the virus.

4 CONCLUSION

This research demonstrates that national holidays can influence the increase in positive cases for SARS-CoV-2, and there are indications for greater contamination over long holidays.

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