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ORIGINAL RESEARCH

Impact of the COVID-19 Pandemic on Elective and Emergency Surgeries, and Postoperative Mortality in a Brazilian Metropolitan Area: A Time-Series Cohort Study

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Purpose: The COVID-19 pandemic posed a worldwide challenge, leading to radical changes in surgical services. The primary objective of the study was to assess the impact of COVID-19 on elective and emergency surgeries in a Brazilian metropolitan area. The secondary objective was to compare the postoperative hospital mortality before and during the pandemic.

Patients and Methods: Time-series cohort study including data of all patients admitted for elective or emergency surgery at the hospitals in the Public Health System of Federal District, Brazil, between March 2018 and February 2022, using data extracted from the Hospital Information System of Brazilian Ministry of Health (SIH/DATASUS) on September 30, 2022. A causal impact analysis was used to evaluate the impact of COVID-19 on elective and emergency surgeries and hospital mortality.

Results: There were 174,473 surgeries during the study period. There was a reduction in overall (absolute effect per week: −227.5; 95% CI: −307.0 to −149.0), elective (absolute effect per week: −170.9; 95% CI: −232.8 to −112.0), and emergency (absolute effect per week: −57.7; 95% CI: −87.5 to −27.7) surgeries during the COVID-19 period. Comparing the surgeries performed before and after the COVID-19 onset, there was an increase in emergency surgeries (53.0% vs 68.8%, $P < 0.001$) and no significant hospital length of stay ($P = 0.112$). The effect of the COVID-19 pandemic on postoperative hospital mortality was not statistically significant (absolute effect per week: 2.1, 95% CI: −0.01 to 4.2).

Conclusion: Our study showed a reduction in elective and emergency surgeries during the COVID-19 pandemic, possibly due to disruptions in surgical services. These findings highlight that it is crucial to implement effective strategies to prevent the accumulation of surgical waiting lists in times of crisis and improve outcomes for surgical patients.

Keywords: COVID-19, surgical procedures, operative, elective surgical procedures, acute care surgery, hospital mortality

Introduction

Numerous hospitals and healthcare facilities had to suspend or limit surgeries to prioritize patient resources in response to the COVID-19 pandemic. This measure was implemented to secure the availability of hospital beds, staff, and personal protective equipment for individuals affected by COVID-19.[1] Besides, implementing lockdown measures and travel restrictions reduced access to healthcare services. The fear of exposure to the virus may have prompted patients to postpone

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seeking medical consultation, exacerbating delays in healthcare procedures, including surgeries.[1,2] Additionally, numerous surgeries were canceled due to positive pre-procedural COVID-19 test results, leading to delays and a backlog of cases.[3] Consequently, the COVID-19 pandemic has significantly impacted elective and emergency surgeries worldwide, leading to cancellations or delays, and procedures initially deemed elective may have transitioned into emergency matters.[1–7]

In addition to the resource constraints during the pandemic, surgeries typically involve close and personal contact between surgeons and their patients that differs from those encountered by non-surgical specialists.[6] In this way, the risk of COVID-19 transmission necessitated additional safety measures such as testing, preoperative quarantines, and cleaning protocols. These measures added complexity and cost to the surgical process.[4,6–9] The postponement or cancellation of elective surgeries can profoundly affect global health systems, as they may contend with an overwhelming backlog of patients awaiting surgery. Furthermore, the increased wait times for surgeries, especially for time-sensitive elective procedures such as cancer treatments, can have potentially devastating effects on patients. These delays elevate the risk of complications in the pre-and postoperative, worsen the quality of life, and may result in unnecessary deaths.[10] Notably, there was an increase in mortality in cardiac surgery in the United States,[11] and the United Kingdom during the COVID-19 pandemic.[12]

In the early months of the pandemic, various surgical societies worldwide recommended canceling elective surgeries.[6,13] However, the impact of the COVID-19 pandemic extended beyond elective procedures, significantly affecting emergency surgeries.[2,13–15] During the COVID-19 lockdown in Italy, an 86% reduction in emergency surgeries was reported.[16] Similar numbers were observed in Greece,[13] the United States,[14] Spain,[15] and Germany.[17] On the contrary, an increase in emergency surgeries in a teaching hospital in Saudi Arabia was observed.[2]

Latin American nations faced an intensified impact of the COVID-19 pandemic compared to more developed counterparts.[18] Brazil, in particular, was one of the most affected countries, with the initial reported case surfacing in São Paulo on February 26, 2020.[19–21] Starting as a localized outbreak in the Southeast, it rapidly spread across the country. The factors contributing to Brazil's severe COVID-19 predicament are multifaceted, including inconsistent containment measures, delayed directives for COVID-19 patient care, limited access to healthcare services, existing disparities in marginalized populations, and the overwhelming strain on an already beleaguered and underfinanced Brazilian public health system.[19]

During the COVID-19 pandemic, hospitals and healthcare systems faced resource constraints. Medical personnel, equipment, and supplies were diverted to COVID-19 response efforts. Operating rooms were repurposed for intensive care units (ICU) or COVID-19 treatment areas, limiting the availability of facilities for surgeries.[4,22] In this circumstance, the primary objective of this study is to assess the impact of COVID-19 on elective and emergency surgeries in a Brazilian metropolitan area. The secondary objective is to compare the postoperative hospital mortality before and after the pandemic.

Materials and Methods

Study Design

A time-series cohort study including all consecutive patients admitted for elective or emergency surgery at the hospitals in the Public Health System of Federal District (FD), Brazil, between March 2018 and February 2022. Data were extracted on September 30, 2022, from the Hospital Information System of Brazilian Ministry of Health (SIH/DATASUS), an audited nationwide database with administrative and epidemiologic information on every hospital admission performed in the healthcare services affiliated with the Brazilian public health system.[23,24]

Setting and Participants

The FD is a metropolitan area with 2,469,489 inhabitants, including the city of Brasilia, the capital of Brazil, and has the highest Human Development Index (HDI) in Brazil. The state government established the first lockdown on March 18, 2020, when there were 36 confirmed cases and another 174 notifications to be evaluated. The lockdown measures included suspending non-essential activities, closing gyms, schools, and shopping centers, restricting people's movement,

and curbing the virus transmission. Thus, in this study, the pre-COVID-19 onset period was defined as between March 2018 and February 2020, and the post-COVID-19 onset period was between March 2020 and February 2022.

The FD public healthcare system comprises 16 hospitals and 13 emergency units. All information regarding admissions and procedures on these healthcare services needs to be provided in SIH/DATASUS to reimburse hospital-related procedures. Thus, the study included all consecutive patients admitted for elective or emergency surgery at the public hospitals of the FD Public Health System between March 2018 and February 2022, informed in the SIH/DATASUS until September 30, 2022. No exclusion criteria were applied.

Data Collection

The SIH/DATASUS plays a pivotal role in the processing and surveillance of hospital admissions in Brazilian public healthcare services. Its database contains relevant parameterized information, including procedure code, hospital identification, and patient information, such as age, sex, city of residence, admission and discharge date, and discharge status. Therefore, the SIH/DATASUS is extensively utilized in epidemiological studies in Brazil.[23–25]

The variables collected from the SIH/DATASUS were age, sex, type of surgery (emergency or elective), site of surgery (digestive, orthopedic/trauma, gynecological/mammary, renal/urinary tract, skin/soft tissue, head/neck, neurological, thoracic, cardiovascular, transplant, and endocrine), admission and discharge date, hospital length-of-stay (LOS), and discharge status (survivor or non-survivor).

Statistical Analysis

The distribution and normality of variables were analyzed using the Shapiro–Wilk test. Quantitative data are expressed as mean ± standard deviation (SD), or median and interquartile range (IQR 25–75%), and categorical variables are expressed as numbers and percentages (%).

Cochran-Armitage test for trend in proportions was also performed to preliminarily compare the number of elective and emergency surgeries between March 2018 and February 2019, March 2019 and February 2020, March 2020 and February 2021, and March 2021 and February 2022.

Then, the number of elective, emergency, and overall surgeries, as well as mortality, were grouped into epidemiological weeks, and the trend of surgeries over the epidemiological weeks during the study period was initially evaluated using linear regression analysis.

Finally, a causal impact analysis was performed using the R package Causal Impact to estimate the causal effect of the COVID-19 onset on the time series of elective, emergency, and overall surgeries, as well as mortality. The causal impact analysis goes beyond traditional interrupted time series (ITS) analysis by integrating Bayesian structural time series models to account for seasonality and other variables. When an intervention or event occurs, the method calculates the causal effect by comparing observed data with what would have been expected based on the model's predictions. While ITS analysis typically focuses on identifying the immediate impact of an intervention, causal impact analysis not only quantifies the immediate effect but also provides a post-intervention counterfactual prediction. The causal impact analysis enables a more comprehensive assessment of the causal effect. Causal impact analysis considers various factors, including seasonality, by modeling the pre-intervention period with a Bayesian structural time series model, capturing seasonal components, trends, and other time-varying covariates and patterns in the model.[25–27] As a control variable in the model, the causal impact analysis of the COVID-19 pandemic on elective, emergency, and overall surgeries, as well as mortality, was adjusted for the estimated population of the FD on each epidemiological week.

To compare age and hospital-LOS between the pre-and post-COVID-19 period, the Student's *t*-test or Mann–Whitney test was performed to assess quantitative variables, as appropriate, and to compare the sex between the pre-and post-COVID-19 period, Pearson's chi-square test ($\chi 2$) was used for categorical variables.

Statistical analyses were performed using the IBM Statistical Package for the Social Sciences version 20.0 for Mac (SPSS 20.0 Mac, SPSS Inc., Chicago, Illinois, USA), Jamovi 2.3.24 (https://www.jamovi.org), and statistical software R version 4.2.3 (https://www.r-project.org/). Statistical significance was set at a two-sided P value ≤ 0.05.

Ethical Considerations

The study adhered to the principles outlined in the Declaration of Helsinki. Our study used data extracted from the SIH/DATASUS, a public database that does not identify research participants. According to Brazilian legislation and Resolution 466/2012 of the Brazilian National Research Ethics Council (CONEP), studies involving only publicly available data that do not identify research participants do not require approval from an Institutional Review Board (IRB) or local ethics review board.

Results

Between March 2018 and February 2022, there were 174,473 surgeries performed in the FD public health system; the majority were digestive surgeries (55,956/174,473; 32.1%), followed by orthopedic/trauma surgeries (48,143/174,473; 27.6%) and gynecological/mammary surgeries (21,280/174,473; 12.2%). Emergency surgeries were 105,655 (60.6%). The mean age was 40.3 ± 20.8 years, and 84,409 (48.4%) were female. The median hospital-LOS was 2.0 days (IQR 25%–75%: 1.0–6.0), and hospital mortality was 1.4% (2,520/174,473), Supplementary Table 1.

Figure 1 shows the causal impact analysis of the COVID-19 pandemic on surgeries performed in the FD public health system adjusted to the FD population over the study period. After COVID-19 onset in Brazil in March 2020, there were

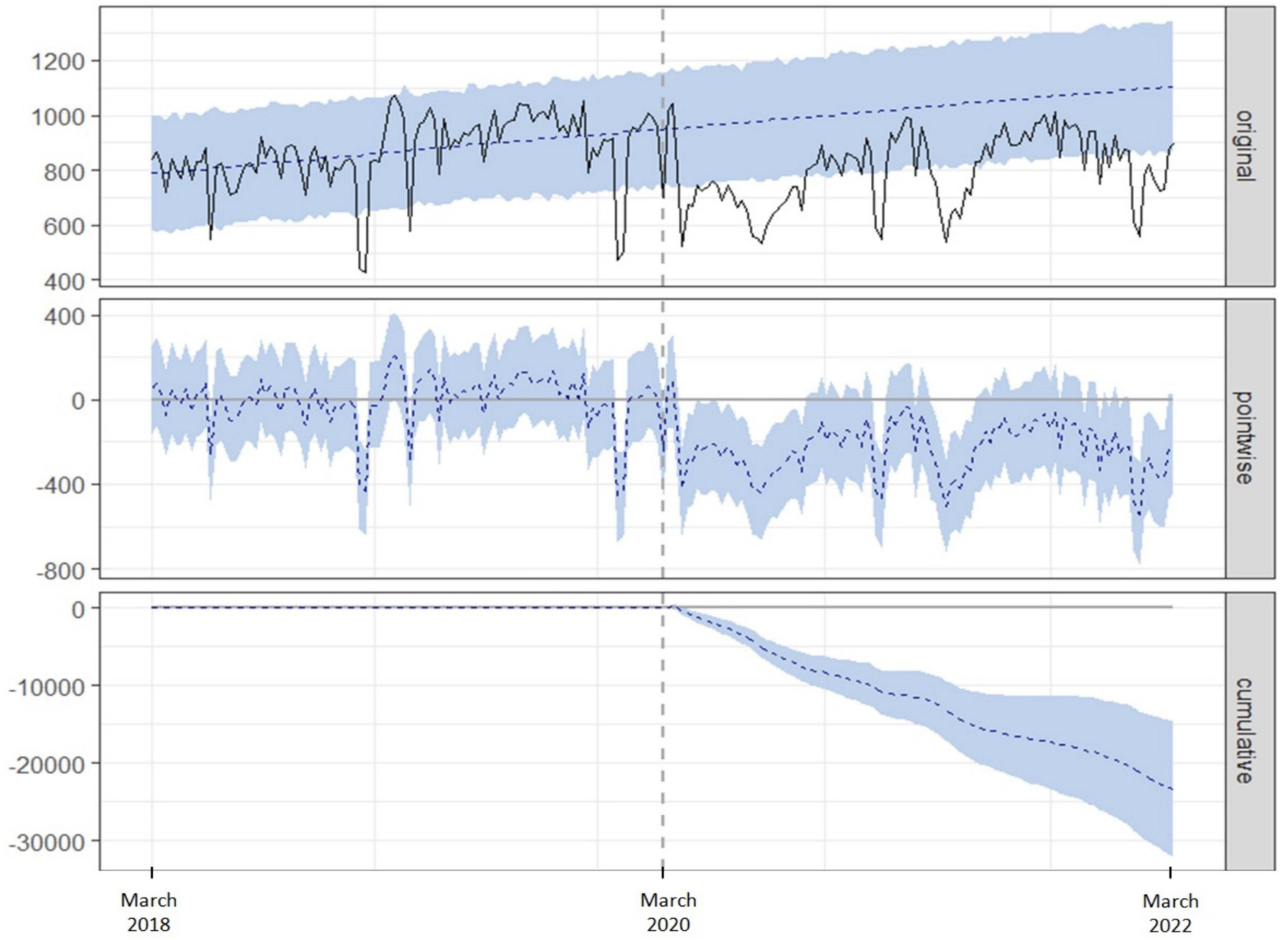

Figure 1 Causal impact analysis of the COVID-19 pandemic on overall surgeries performed in the Federal District public health system adjusted to the Federal District population using data from March 2018 to February 2022. The first panel shows the observed surgeries (solid black line), the counterfactual prediction if COVID-19 had not occurred adjusted to the Federal District population over time (dotted blue line), and the 95% confidence interval (95% CI) of the counterfactual prediction. The second panel shows the difference between observed surgeries and the counterfactual prediction, the pointwise causal effect of COVID-19 on surgeries adjusted to the Federal District population over time (dotted blue line). The third panel shows the pointwise contributions from the second panel, resulting in a plot of the cumulative effect of COVID-19 on surgeries (dotted blue line). After the COVID-19 onset in Brazil in March 2020 (dotted gray vertical line), the 95% CI of the cumulative effect of COVID-19 on surgeries (shaded region) moves below the counterfactual prediction of cumulative surgeries (x-axis baseline) over time, reducing significantly at the end of the follow-up from the counterfactual prediction of cumulative surgeries by the model.

82,568 surgeries, while 105,998 (95% CI: 97,204–114,789) surgeries would have been expected if the COVID-19 pandemic had not occurred. The effect of the COVID-19 pandemic reducing surgeries is statistically significant for the entire period after the COVID-19 onset, with an absolute effect of −227.5 (95% CI: −307.0 to −149.0) surgeries per epidemiological week and a relative effect of −22.0% (95% CI: −28.0 to −16.0%).

Despite an overall reduction in elective and emergency surgeries, there was a relative increase in emergency surgeries related to elective surgeries per year in the post-COVID-19 period compared to the pre-COVID-19 period ($P < 0.001$), Figure 2.

Figure 3 shows the causal impact analysis of the COVID-19 pandemic on elective surgeries performed in the FD public health system adjusted to the total number of surgeries over the study period. After COVID-19 onset in Brazil in March 2020, there were 25,783 elective surgeries, while 43,382 (95% CI: 37,314–49,763) elective surgeries would have been expected if the COVID-19 pandemic had not occurred. The effect of the COVID-19 pandemic in reducing elective surgeries is statistically significant when considering the entire period after the COVID-19 onset, with an absolute effect of −170.9 (95% CI: −232.8 to −112.0) elective surgeries per epidemiological week and a relative effect of −40.0% (95% CI: −48.0 to −31.0%).

Figure 4 shows the causal impact analysis of the COVID-19 pandemic on emergency surgeries performed in the FD public health system adjusted to the FD population over the study period. After COVID-19 onset in Brazil in March 2020, there were 56,839 emergency surgeries, while 62,783 (95% CI: 59,693–65,850) emergency surgeries would have been expected if the COVID-19 pandemic had not occurred. The effect of the COVID-19 pandemic in reducing emergency surgeries is statistically significant when considering the entire period after the COVID-19 onset, with an absolute effect of −57.7 (95% CI: −87.5 to −27.7) emergency surgeries per epidemiological week and a relative effect of −9.4% (95% CI: −14.0 to −4.8%).

Supplementary Table 2 shows the causal impact analysis of the COVID-19 pandemic on surgeries performed in the FD public health system according to surgery sites and adjusted to the total number of surgeries performed over the study period. Head/Neck (relative effect: −43.0, 95% CI: −53.0 to −28.0) was the surgery site with the highest reduction, followed by renal/urinary tract (relative effect: −30.0, 95% CI: −39.0 to −21.0) and skin/soft tissue (relative effect: −29.0, 95% CI: −39.0 to −18.0). Only transplant and endocrine surgeries did not show significant differences at the end of the follow-up from the counterfactual prediction of cumulative surgeries by the model when considering the entire period after the COVID-19 onset.

Figure 5 shows the causal impact analysis of the COVID-19 pandemic on in-hospital mortality after surgeries performed in the FD public health system adjusted to the total number of surgeries over the study period. After the onset of COVID-19 in Brazil in March 2020, there were 1279 in-hospital mortality after the onset of COVID-19 in Brazil on March 2020, compared

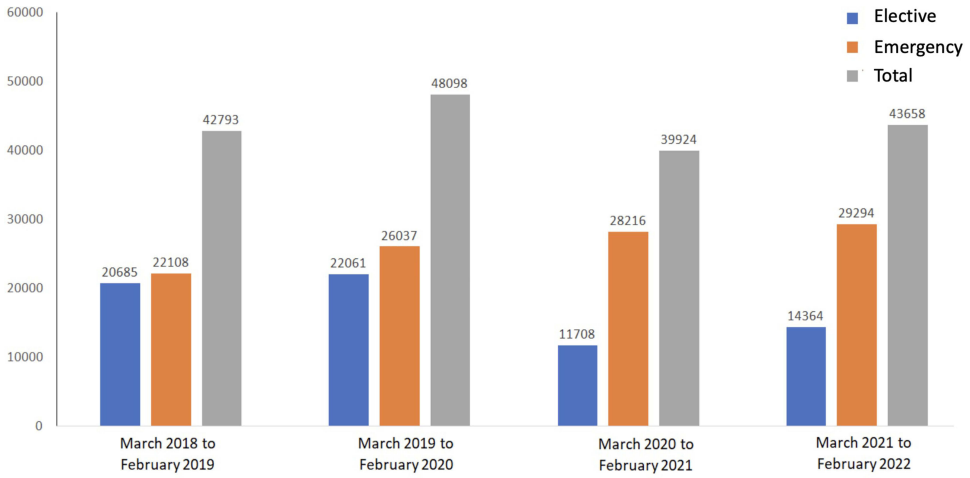

Figure 2 Elective, emergency, and overall surgeries performed in the Federal District public health system annually from March 2018 to February 2022 (n = 174,473). Cochran-Armitage test for trend in proportions: *P* value < 0.01.

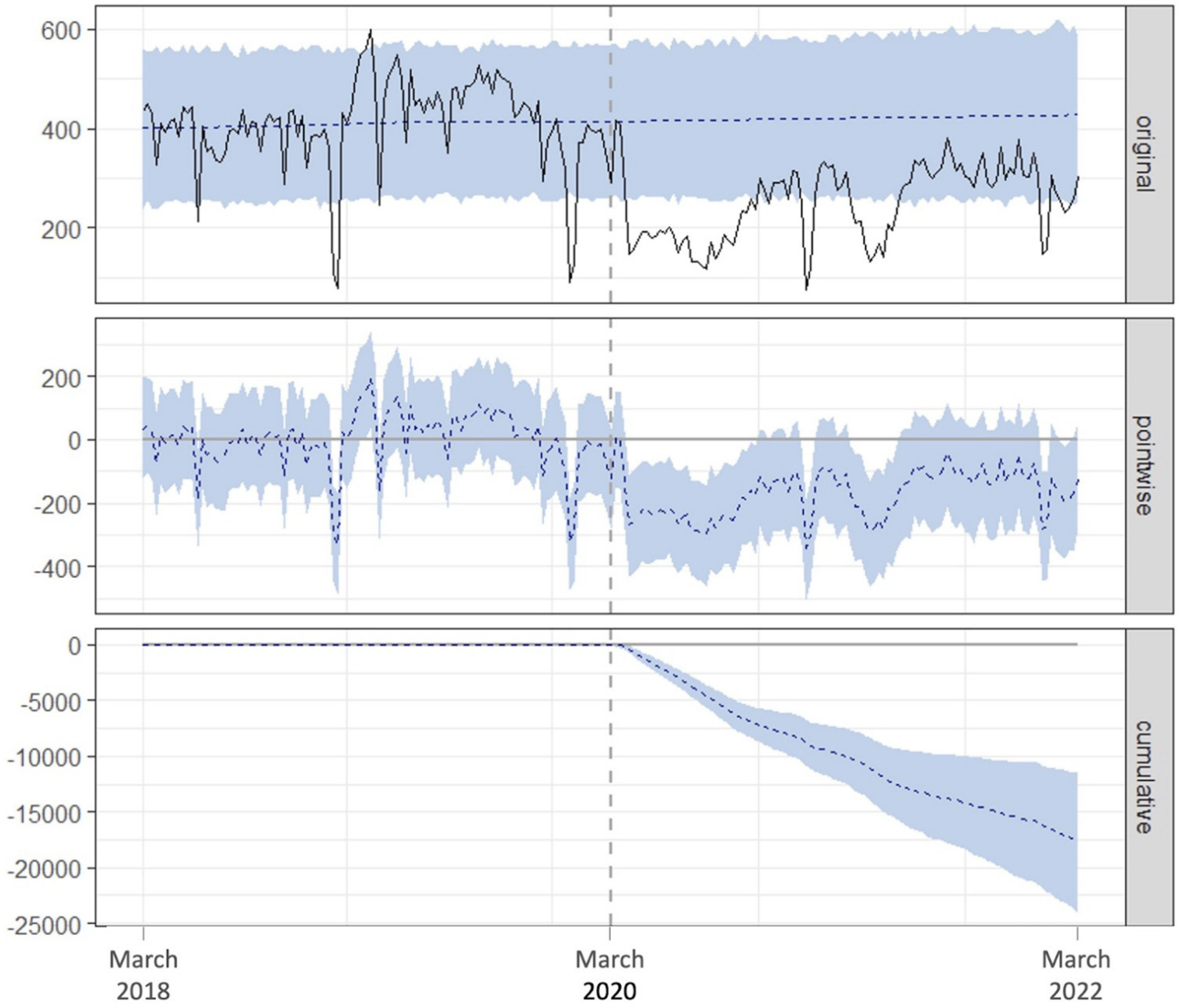

Figure 3 Causal impact analysis of the COVID-19 pandemic on elective surgeries performed in the Federal District public health system adjusted to the Federal District population using data from March 2018 to February 2022. The first panel shows the observed elective surgeries (solid black line), the counterfactual prediction if COVID-19 had not occurred adjusted to the Federal District population over time (dotted blue line), and the 95% confidence interval (95% CI) of the counterfactual prediction. The second panel shows the difference between observed elective surgeries and the counterfactual prediction, the pointwise causal effect of COVID-19 on elective surgeries adjusted to the overall surgeries (dotted blue line). The third panel shows the pointwise contributions from the second panel, resulting in a plot of the cumulative effect of COVID-19 on elective surgeries (dotted blue line). After the COVID-19 onset in Brazil in March 2020 (dotted gray vertical line), the 95% CI of the cumulative effect of COVID-19 on elective surgeries (shaded region) moves below the counterfactual prediction of cumulative elective surgeries (x-axis baseline) over time, reducing significantly at the end of the follow-up from the counterfactual prediction of cumulative elective surgeries by the model.

to 1067 in-hospital mortality that was expected if the COVID-19 pandemic had not occurred (95% CI: 850–1280). After adjusting for the FD population over the study period, the effect of the COVID-19 pandemic on hospital mortality was not statistically significant when considering the entire period after the COVID-19 onset, with an absolute effect per epidemiological week of 2.1 in-hospital mortality (95% CI: −0.01 to 4.2) and a relative effect of 21% (95% CI: −0.1% to 51.0%).

Comparing the surgeries before and after the COVID-19 onset in Brazil, there were no significant differences regarding age, sex, and hospital-LOS between the two periods, Supplementary Table 3.

Discussion

The COVID-19 pandemic disrupted the healthcare systems, postponing non-essential medical procedures due to various factors such as recommendations to allocate resources for COVID-19 patients and fear of infection.[1,5,28–30] In this

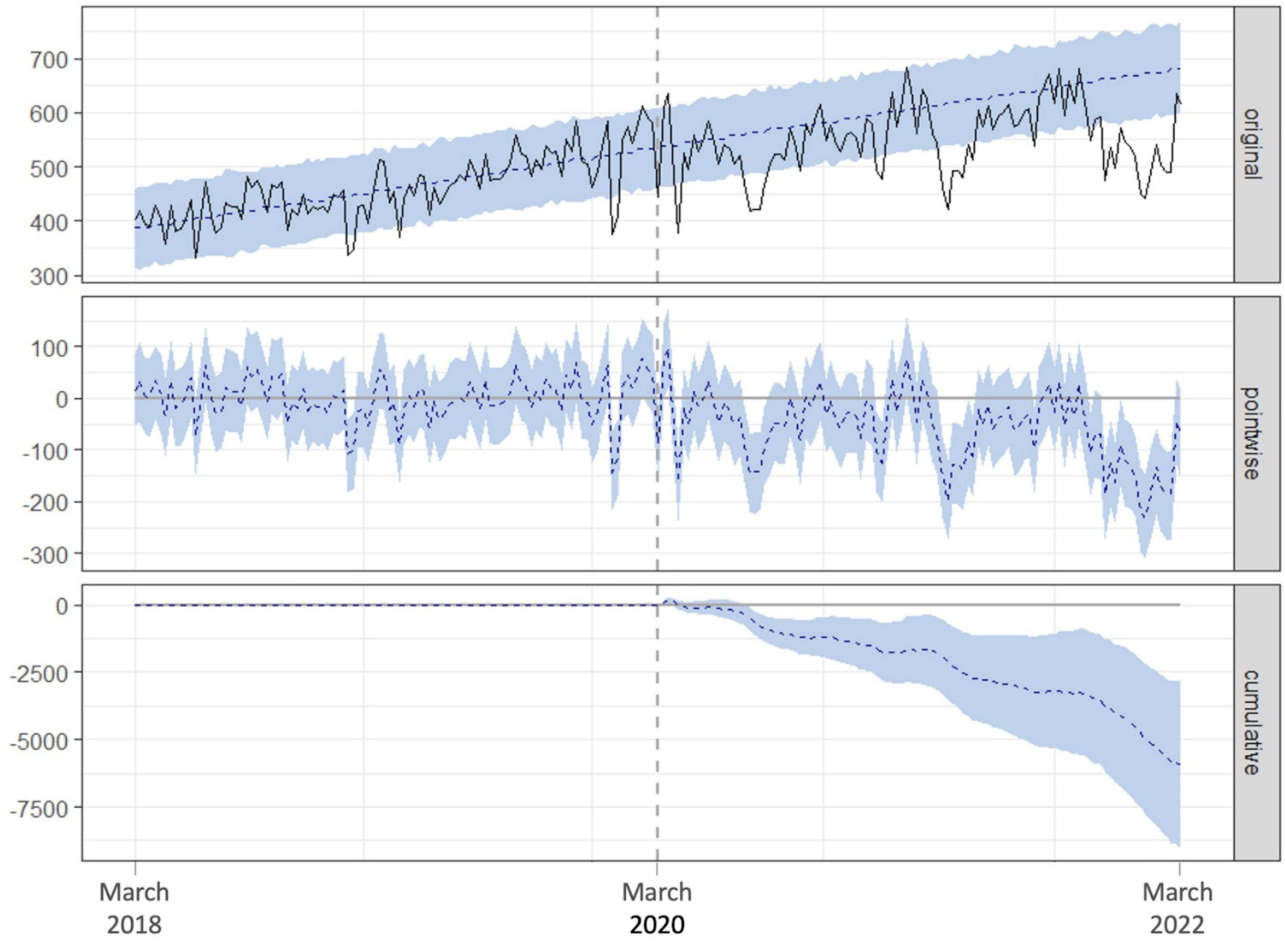

Figure 4 Causal impact analysis of the COVID-19 pandemic on emergency surgeries performed in the Federal District public health system adjusted to the Federal District population using data from March 2018 to February 2022. The first panel shows the observed emergency surgeries (solid black line), the counterfactual prediction if COVID-19 had not occurred adjusted to the overall surgeries over time (dotted blue line), and the 95% confidence interval (95% CI) of the counterfactual prediction. The second panel shows the difference between observed emergency surgeries and the counterfactual prediction, the pointwise causal effect of COVID-19 on emergency surgeries adjusted to the total surgeries (dotted blue line). The third panel shows the pointwise contributions from the second panel, resulting in a plot of the cumulative effect of COVID-19 on emergency surgeries (dotted blue line). After the COVID-19 onset in Brazil in March 2020 (dotted gray vertical line), the 95% CI of the cumulative effect of COVID-19 on emergency surgeries (shaded region) moves below the counterfactual prediction of cumulative emergency surgeries (x-axis baseline) over time, reducing significantly at the end of the follow-up from the counterfactual prediction of cumulative emergency surgeries by the model.

context, our study observed a reduction in elective and emergency surgeries during the COVID-19 pandemic compared to the counterfactual prediction in a Brazilian metropolitan area. In addition to the reallocation of resources to combat the pandemic, economic uncertainties and the imposition of lockdown measures during the pandemic might have compelled individuals to postpone surgeries, particularly those facing financial challenges, job loss, or future income apprehension.[31,32] Notably, this reduction in surgeries during periods of crisis like COVID-19 was also observed in other situations, such as the Ebola outbreak in West African countries between January 2014 and May 2015.[33]

Previous studies in different countries have also shown reductions in elective surgeries during the COVID-19 pandemic, such as Finland,[1] Saudi Arabia,[2] the United States,[34,35] Austria,[36] India,[37] Germany,[38] the United Kingdom,[39,40] France,[41] and Italy.[42,43] It was estimated that 28.4 million surgeries were canceled worldwide during the first wave of the pandemic.[44] A multicentric study in Finland noted a rapid reduction in elective surgeries soon after the COVID-19 pandemic onset in March 2020. However, in contrast to our findings, the number of elective surgeries rebounded in May–June 2020. Following this recovery, elective surgeries were 22% higher than in the reference years and maintained this level until the end of the year.[1] Another study utilizing a hospital administrative database in the United States, representing about 25% of inpatient discharges, noted a 71.3% reduction in elective surgeries in April 2020 compared to 2019 that did not recover to pre-pandemic levels until December 2020.[34] Besides, a review

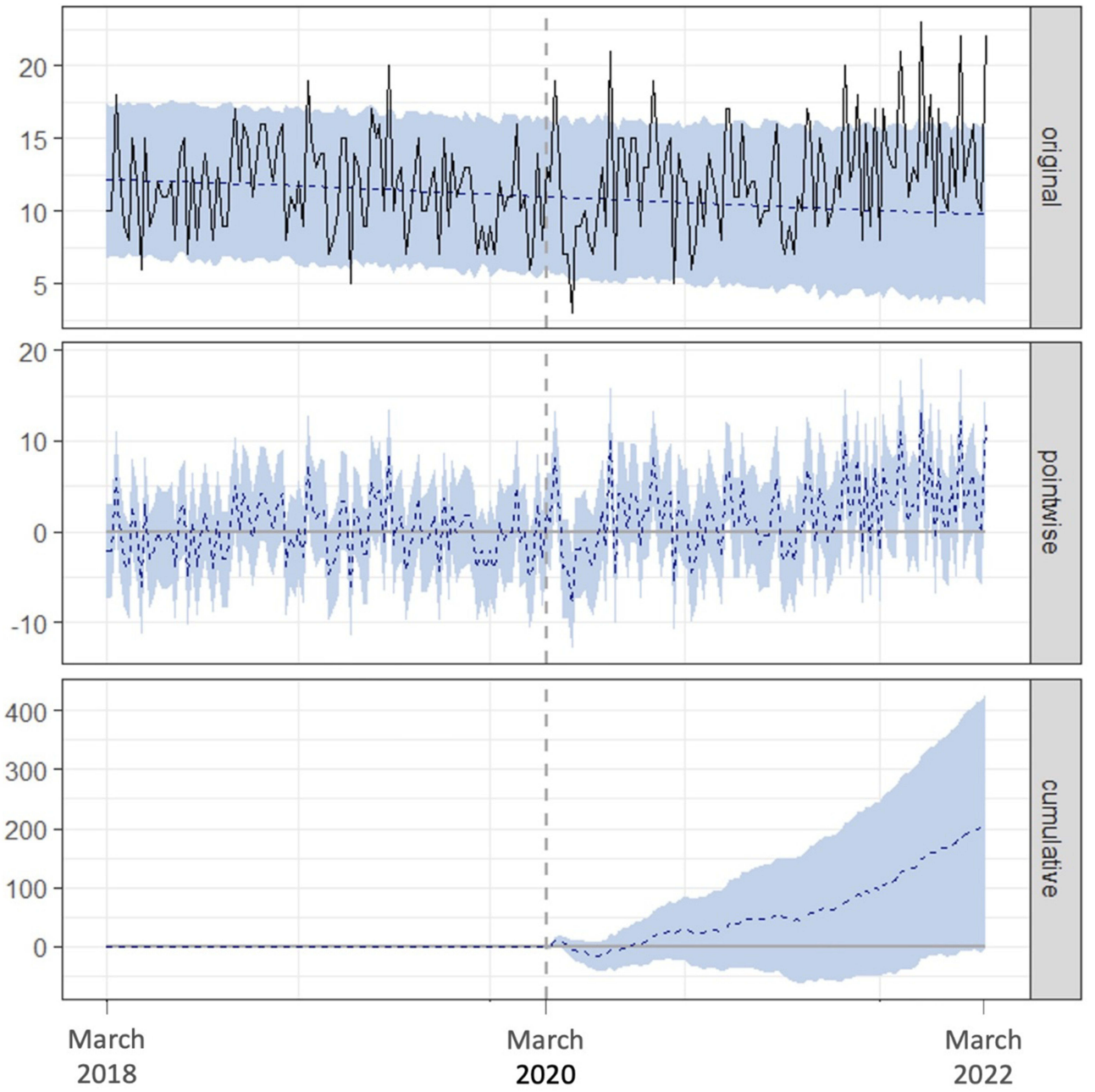

Figure 5 Causal impact analysis of the COVID-19 pandemic on in-hospital mortality in the Federal District public health system adjusted to the Federal District population over time using data from March 2018 to February 2022. The first panel shows the observed in-hospital mortality (solid black line), the counterfactual prediction if COVID-19 had not occurred adjusted to the Federal District population over time (dotted blue line), and the 95% confidence interval (95% CI) of in-hospital mortality of the counterfactual prediction. The second panel shows the difference between observed in-hospital mortality and the counterfactual prediction, the pointwise causal effect of COVID-19 on in-hospital mortality adjusted to the Federal District population population over time (dotted blue line). The third panel shows the pointwise contributions from the second panel, resulting in a plot of the cumulative effect of COVID-19 on in-hospital mortality (dotted blue line). After the COVID-19 onset in Brazil in March 2020 (dotted gray vertical line), the 95% CI of the cumulative effect of COVID-19 on in-hospital mortality includes the counterfactual prediction of cumulative in-hospital mortality (x-axis baseline) almost over time and at the end of the follow-up, meaning that it does not deviate significantly from the counterfactual prediction by the model.

analyzing data from studies in various countries observed a reduction in elective surgeries for colorectal cancer, ranging from 1% in New Zealand to 74% in the United States.[35]

The disparate impact of COVID-19 on elective surgeries across nations can be attributed to the extent of the pandemic's effect on each country, including the strain imposed on healthcare services, the characteristics of their populations, and the measures taken by their respective governments during the pandemic.[20,45,46] Regarding the diversities, Brazil offers a singular opportunity to evaluate the abovementioned issues as it stands among the countries

most severely affected by COVID-19 worldwide, ranking second in mortality.[20,21] Besides, the Brazilian government has recommended temporarily suspending elective procedures multiple times during the pandemic, and 75% of the Brazilian population relies solely on the public health system for healthcare.[47,48] A time series study that evaluated the first 9-month period of the COVID-19 pandemic in Brazil (March to December 2020) observed a 46% decrease in elective procedures in the public healthcare system, which corresponds closely to the 40% reduction in elective surgeries observed in our study.[48] In Italy, a country also severely affected by COVID-19, which exerted extraordinary pressures on the healthcare and long-term care systems, particularly during the first wave (March to May 2020), a survey of general surgery departments revealed a reduction in adequate beds dedicated to surgical procedures, affecting 59% of the surgical units, with 12.4% closed between March and May 2020, 2.6% between June and September 2020, and 7.7% between October and December 2020 (second wave in Italy).[43]

While the percentage of emergency surgeries related to elective surgeries relatively increased, the total number remained below the counterfactual prediction. Studies in Greece,[13] Spain,[16] Germany,[17] the United States,[8,14] Portugal,[49] and Italy[16,50] also observed a reduction in emergency surgeries. However, other studies showed different findings. In a study conducted at an emergency general surgery and trauma center in the United States, the number of emergency procedures during the COVID-19 pandemic remained similar to pre-pandemic levels. This study also observed higher rates of exploratory laparotomy and increased physiologic derangement upon presentation during the pandemic compared to the pre-pandemic period, which could be associated with patients presenting later for treatment.[51] Another study at a teaching hospital in Saudi Arabia reported an increase in emergency surgeries, but it did not compare the total number of emergency surgeries to a counterfactual prediction as performed in our study.[2]

Our study showed no effects of the COVID-19 period on hospital-LOS and mortality. Previous studies show conflicting results regarding these findings.[8,13,41,49,52–54] Similar to our findings, a study reported a decrease in elective and emergency cardiac surgeries in Sweden without a difference in mortality and postoperative complications.[55] In France, a national database study also showed that mortality following elective digestive resections remained stable during the COVID-19 pandemic.[41] Besides, a study performed in Spain showed no difference in mortality or reoperation rate during the COVID-19 pandemic.[53] On the contrary, a study in the United States noted a reduction in emergency surgeries and increased perioperative mortality and ICU admission rates after the COVID-19 onset.[8] In Portugal, a decrease of 30% in emergency surgery, accompanying the increase of newly COVID-19 diagnosed cases and containment measures, was observed. A higher mortality rate was also noted during the COVID-19 pandemic.[49] An international cohort study across 40 countries observed a shorter hospital-LOS and higher mortality in elective colorectal cancer surgery during the COVID-19 pandemic.[54] Other studies in Greece,[13] the United Kingdom,[39] Russia,[55] and Italy[56] also observed increased mortality during COVID-19. In a scoping review, it was observed that there was a delay in patients seeking care in emergency general surgeries, but it was impossible to conclude that there were more complications or increased mortality during the pandemic.[57]

Our study has some limitations. Firstly, there is a lack of information on the specific indications for elective and emergency surgeries, preoperative evaluations, surgery waiting time, and the complete demographic characteristics of the patients, including their socioeconomic status and schooling level. Additionally, there was no data regarding the frequency of COVID-19 among the study population. Moreover, it is crucial to recognize that additional factors not considered in our study could have impacted the outcomes. Finally, in the causal impact analysis, the assessment of COVID-19's impact on overall, elective and emergency surgeries and mortality involves three key components: a regression component linking the outcomes during the COVID-19 period to the outcomes on counterfactual prevision, a time-series component capturing temporal patterns in the data, and an error element accounting any unpredicted variation. Despite its strengths, there are limitations to using the causal impact analysis. Specifically, the underlying time-series model typically entails numerous unknown parameters, necessitating substantial data for accurate estimation, including counterfactual prediction. Regarding these facts, our study included 174,473 surgeries, providing a robust dataset. Further, the performance of causal impact may be affected if the outcome is susceptible to measurement errors. However, this fact does not apply to the outcomes evaluated in our study.[26,27]

Conclusion

Our study observed a significant detrimental impact of the COVID-19 pandemic on surgical services, reducing overall, elective, and emergency surgeries. These findings highlight the profound consequences of the pandemic on surgical healthcare, emphasizing the need for effective strategies to mitigate the enduring effects of postponed surgeries, especially elective ones. Healthcare systems must develop robust, adaptable approaches that ensure the continuity of surgical services to improve overall health outcomes and prevent the accumulation of surgical waiting lists, even in crises like the COVID-19 pandemic.

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Disclosure

The authors report no conflicts of interest in this work.

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