The Impact of the COVID-19 Pandemic on Cancer Care in Brazil: From Screening to Treatment

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Efeitos da Covid-19 na Atenção ao Câncer no Brasil: Impactos do Rastreamento ao Tratamento

Efectos de la COVID-19 en la Atención Oncológica en el Brasil: Impactos del Tamizaje al Tratamiento

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ABSTRACT

Introduction: The COVID-19 pandemic has had a significant impact in Brazil, resulting in more than 700,000 deaths. The entire health system has been affected, including cancer care. **Objective:** To quantify the impact of the pandemic on the offer of cancer care procedures in Brazil. **Method:** Time series analysis based on data from the Brazilian National Health System. The monthly frequency of confirmed COVID-19 cases and cancer-related procedures, including breast and cervical cancer screening tests and diagnostic and treatment procedures for all types of cancer were calculated for the pre-pandemic year (2019) and the pandemic period (2020-2022). Joinpoint regression was used to calculate monthly percentage changes (MPC). **Results:** A decrease in all cancer-related procedures, except chemotherapy and radiotherapy, was identified during the pandemic. The most significant declines occurred from April to June 2020, which closely aligns with Brazil's lockdown period, and from December 2021 to February 2022, coinciding with the spread of the Omicron variant in the country. During Brazil's initial wave of COVID-19, screening tests experienced significant declines. Pap smears decreased 44.90% (95%CI -49.21 to -35.71) and mammograms, 45.79% (95%CI -44.88% to -28.85). Later, procedures oscillated according to an increase in COVID-19 cases returning to pre-pandemic standards only in 2022. **Conclusion:** A gradual resumption of procedures has occurred, with levels returning to those observed prior to the pandemic in 2022. It is expected that an increase in the range of these procedures will eventually mitigate the consequences of probable delays in cancer diagnosis and treatment.

Key words: Early Detection of Cancer/statistics & numerical data; Medical Oncology/statistics & numerical data; Epidemiological Monitoring; Coronavirus Infections; SARS-CoV-2.

RESUMO

Introdução: A pandemia de covid-19 teve impacto significativo no Brasil, resultando em mais de 700 mil mortes. Todo sistema de saúde foi impactado, inclusive o atendimento oncológico. **Objetivo:** Quantificar o impacto da pandemia na oferta de procedimentos da linha de cuidado do câncer no Brasil. **Método:** Estudo de série temporal com dados secundários dos Sistemas de Informação do Sistema Único de Saúde. Frequências mensais de casos confirmados de covid-19 e procedimentos de rastreamento dos cânceres de mama e do colo do útero, diagnóstico e tratamento de todos os tipos de câncer foram calculadas para o ano pré-pandêmico (2019) e o período pandêmico (2020-2022). Variações percentuais mensais (VPM) no registro de procedimentos foram calculadas pelo método *Joinpoint*. **Resultados:** Houve redução em todos os procedimentos durante a pandemia, exceto quimioterapia e radioterapia. Maiores declínios ocorreram entre abril e junho de 2020, período de *lockdown* no Brasil, e dezembro de 2021 a fevereiro de 2022, coincidindo com a disseminação da variante Ômicron. Durante a primeira onda da covid-19, exames de rastreamento foram mais afetados, com redução de 44,90% (IC95% -49,21 a -35,71) nos exames de Papanicolaou e 45,79% (IC95% -44,88% a -28,85) nas mamografias. Posteriormente, os procedimentos oscilaram de acordo com o aumento de casos de covid-19, retornando aos patamares pré-pandêmicos somente em 2022. **Conclusão:** Houve retomada gradual da realização dos procedimentos, retomando aos níveis pré-pandêmicos em 2022. Espera-se uma ampliação da oferta desses procedimentos para mitigar as consequências de prováveis atrasos no diagnóstico e no tratamento do câncer.

Palavras-chave: Detecção Precoce de Câncer/estatística & dados numéricos; Oncologia/estatística & dados numéricos; Monitoramento Epidemiológico; Infecções por Coronavírus; SARS-CoV-2.

RESUMEN

Introducción: La pandemia de la COVID-19 ha tenido impacto significativo en el Brasil, causando más de 700 000 muertes. Todo el sistema de salud se ha visto afectado, incluida la oncología. **Objetivo:** Cuantificar el impacto de la pandemia en la oferta de procedimientos de atención oncológica en el Brasil. **Método:** Estudio de series de tiempo basado en datos secundarios de los Sistemas de Información del Sistema Único de Salud. Se calcularon las frecuencias mensuales de casos de COVID-19 y de procedimientos de tamizaje de cáncer de mama y de cuello de útero, diagnóstico y tratamiento de todos los tipos de cáncer para el año prepandémico (2019) y el período pandémico (2020-2022). Se calcularon las variaciones porcentuales mensuales (VPM) mediante el método *Joinpoint*. **Resultados:** Se produjo reducción de los procedimientos durante la pandemia, excepto la quimioterapia y la radioterapia. Los mayores descensos se produjeron entre abril y junio de 2020 (periodo de confinamiento en el Brasil), y de diciembre de 2021 a febrero de 2022, coincidiendo con la diseminación de la variante Ómicron. Durante la oleada inicial de la COVID-19 en el Brasil, el tamizaje fue el más afectado, con reducción del 44,90 % (IC 95 %: -49,21 a -35,71) en las citologías y del 45,79 % (IC 95 %: -44,88 a -28,85) en las mamografías. Los procedimientos fluctuaron en función del aumento de casos de COVID-19, volviendo a los niveles previos a la pandemia solo en 2022. **Conclusión:** Hubo una reanudación gradual de los procedimientos, volviendo a los niveles previos a la pandemia en 2022. Se espera un aumento de la oferta de estos procedimientos para mitigar las consecuencias de los probables retrasos en el diagnóstico y tratamiento del cáncer.

Palabras clave: Detección Temprana del Cáncer/estadística & datos numéricos; Oncología Médica/estadística & datos numéricos; Monitoreo Epidemiológico; Infecciones por Coronavirus; SARS-CoV-2.

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INTRODUCTION

The global healthcare system was significantly affected by the COVID-19 pandemic. Global health organizations suggested postponing elective exams and procedures to minimize the spread of the disease. In addition, the necessary reassignment of personnel and healthcare resources to address the pandemic has presented challenges related to the organization of care and the utilization of resources[1,2].

Several studies conducted mainly in high-income countries showed a great reduction in HPV vaccination, an important risk factor for cervical cancer, cancer screening, diagnosis referrals, and treatments during the pandemic[3-5]. Although the impacts are highly documented, there is still a lack of research assessing the drops and recoveries in the offer of procedures, especially after COVID-19 vaccination in low- and medium-income countries[6].

The first COVID-19 case in Latin America was recorded in Brazil on February 26, 2020. The number of COVID-19 cases and deaths related to the disease increased constantly until they peaked in late May 2020. Due to the lack of a national strategy to manage and contain the virus, some States and cities implemented local lockdown measures[7]. In total, over 700 thousand deaths occurred in the country until 2023[8].

In the beginning of the pandemic, in 2020, the National Cancer Institute (INCA) recommended postponing screening exams and prioritizing diagnostic investigation and treatment of positive or symptomatic cases. Later, in 2021, given the epidemiological scenario and responsiveness of the healthcare system at a local level, the resumption of screening procedures was recommended, with a focus on prioritizing diagnosis confirmation and treatment[9].

The National Health System (SUS) is responsible for medical care of nearly 80% of the Brazilian population[10]. The country has a national policy of prevention and control that guides national actions, from prevention to rehabilitation and, though it possesses no organized monitoring programs, it does have national guidelines for cervical and breast cancer screening[11,12].

HPV vaccination is available in the country, and access to cancer diagnosis and treatment are important challenges to the health system[13,14].

The objective of this study is to quantify the impact of the pandemic on the offer of cancer care procedures in Brazil.

METHOD

Time series analysis on the impact of the COVID-19 pandemic in cancer screening, diagnosis and treatment in Brazil, using publicly available data from the country's Ministry of Health.

The data source used for this study includes the SUS Ambulatory Information System[15] (SIA-SUS), the SUS Hospital Information System[16] (SIH-SUS) and the Authorizations for High Complexity Procedures (APAC) database[15]. The data are available on the SUS Informatics Department (DATASUS)[17]. This study includes all the records of procedures performed by the SUS from 2019 to 2022.

The monthly databases were downloaded from those information systems and the interest procedures extracted, using the SUS procedure table codes.

The procedures were classified into three groups: screening (cervix cytopathological exams and mammograms), diagnosis (biopsies and histopathological exams) and treatment (cervical excision for treatment of cervical precursor lesions, oncological surgeries, chemotherapy and radiotherapy).

Data on screening were obtained from the ambulatory production file of SIA-SUS, by selecting the codes 02.03.01.001-9 and 02.03.01.008-6 for cervical cancer cytopathological screening tests, and 02.04.03.018-8 for screening mammograms. The selection of screening procedures was based on the official recommendations by the Ministry of Health, in which only cervix and breast cancer have national screening guidelines and specific procedures in the SUS procedure table.

Data on diagnostic investigation were analyzed for every type of cancer and obtained from SIA-SUS, including all the biopsy procedures (codes 02.01.01.00-20 to 02.01.01.054-2; 02.01.01.066-6; 02.01.01.056-9; 02.01.01.058-5 e 02.01.01.060-7) and every anatomopathological exam procedures (codes 02.03.02.003-0, 02.03.02.008-1, 02.03.02.002-2 and 02.03.02.007-3 e 02.03.02.006-5).

Data referring to the treatment was obtained from SIA-SUS, SIH-SUS and APAC. The treatment of cervical precursor lesions has specific codes for record and can be performed in the outpatient clinic or in a hospital environment, having been selected all the cervix excision codes (04.09.06.008-9, 04.09.06.003-8 and 04.09.06.030-5) in the SIA-SUS and SIH-SUS. The information on oncological surgeries was obtained from the selection of the 0416 procedures subgroup (oncological surgeries) on the SIH-SUS database. The chemotherapy and radiotherapy data were selected from the specific SIA-SUS (AQ-APAC chemotherapy and AR-APAC radiotherapy) database, which encompasses all the codes concerning those procedures.

Population data were obtained from the *Instituto Brasileiro de Geografia e Estatística* (IBGE)[18]. The number

of monthly confirmed COVID-19 cases were provided by *Coronavírus Brasil*, a national platform dedicated to publishing data on COVID-19[19].

The data were collected from January 2019 to December 2022. The year 2019 was used for the pre-pandemic period, while the years 2020, 2021 and 2022 were considered the pandemic period. Only for the radiotherapy procedures, the data collection period started in June 2019, due to a change in the SUS database recording in May 2019[20], which would impair comparison with posterior data.

Monthly graphs were created using the *R* software version 4.3.1[21] to represent the provision of procedures and COVID-19 confirmed cases.

The gross monthly rates of each procedure performance were calculated by dividing the number of recorded procedures by the resident Brazilian population and multiplying it for 100 thousand. The breast and cervix cancer monitoring exams rates were calculated using the female population as common denominator. The average monthly percentage change (MPC) and the respective confidence intervals of 95% (95%CI) were calculated for each procedure, to indicate the monthly increase or decrease, as well as the magnitude of changes during the period. The trend analysis was performed through Joinpoint regression using the Joinpoint Regression software (version 5.0.2)[22].

An autocorrelation in the data was detected through the autocorrelation function (ACF). Thus, the models were adjusted for first order autocorrelation using the Joinpoint software[22].

This study was not submitted to the appreciation of Research Ethics Committee as it exclusively used secondary data of public access and of impossible individual identification, according to Resolution number 510[23] of April 7th, 2016, of the National Health Council.

RESULTS

In Brazil, from January to December 2019 (this study's pre-pandemic period), the monthly average of exams performed by the SUS was of 705,011 pap smear exams, 307,859 mammograms, 62,235 biopsies, 2,196 excisional treatments of cervical precursor lesions, 13,365 oncological surgeries, 304,712 chemotherapies and 12,202 radiotherapy procedures. However, from March 2020, there was a significant reduction of almost all procedures, mainly between May 2020 and August 2020, period in which social distancing measures were intensified, and some States implemented a lockdown policy (Figure 1).

The first confirmed case of COVID-19 was recorded in February 2020. The number of cases increased constantly until they peaked in late May of the same year, followed by stability and reduction. However, Brazil experienced a second wave of COVID-19 transmission during the summer, coinciding with the holiday and vacation season, as well as flexibility of mobility restrictions, mainly in November and December 2020. The vaccination campaign in Brazil began in January 2021, but only in March 2021 it began effectively. Between March and June 2021, there was a substantial increase in the number of COVID-19 cases. In the following months, from July to November 2021, there was a decline in the number of cases. Then, in December 2021, a new wave of transmission began with the rise of the Omicron variant that spread rapidly, provoking a considerable increase of cases in 2022 (Figures 1 to 4).

As observed in Figure 1, most drops in SUS procedures occurred during the lockdown period, between March and May, and then, reductions were heightened when new COVID-19 cases increased.

The greatest decrease in pap smears occurred in May 2020, with 83.2% less recorded procedures than the year before. There were 1,286,333 new confirmed cases of COVID-19, a significant increase compared to the 239,089 confirmed cases in the previous month (Figure 1).

A similar trend was observed for mammograms, which presented a reduction of 83.4% in May 2020. In October and November 2020, the number of new COVID-19 cases decreased, and monitoring was resumed, however, a new surge of confirmed cases of COVID-19 in December 2020 and the first quarter of 2021 was followed by an even greater reduction than the initially observed in monitoring. In late 2021, there was a new surge of COVID-19 cases, followed by a reduction in monitoring exams, though not as expressive as the year before (Figure 1).

The trend analysis indicated a significant increase in the provision of cytopathological exams between January and November 2019 (MPC = 1.63; 95%CI: 0.47-3.86), followed by significant reductions between November 2019 and March 2020 (MPC = -6.70; 95%CI: -12.60 to -2,33) and between March 2020 and June 2020 (MPC = -44.90, 95%CI: -49.21 to -35.71). From June to October 2020, there was a significant increase (MPC=54.76, 95%CI 39.15 - 67.29), followed by a discrete decrease and non-significant from October 2020 to May 2021 (MPC=-2.73, 95%CI -7.62 - 0.13). From May to November 2021, a significant increase was found (MPC=9.08, 95%CI 5.68 -17.74), followed by a significant decrease from November 2021 to February 2022 (MPC=7.98, 95%CI

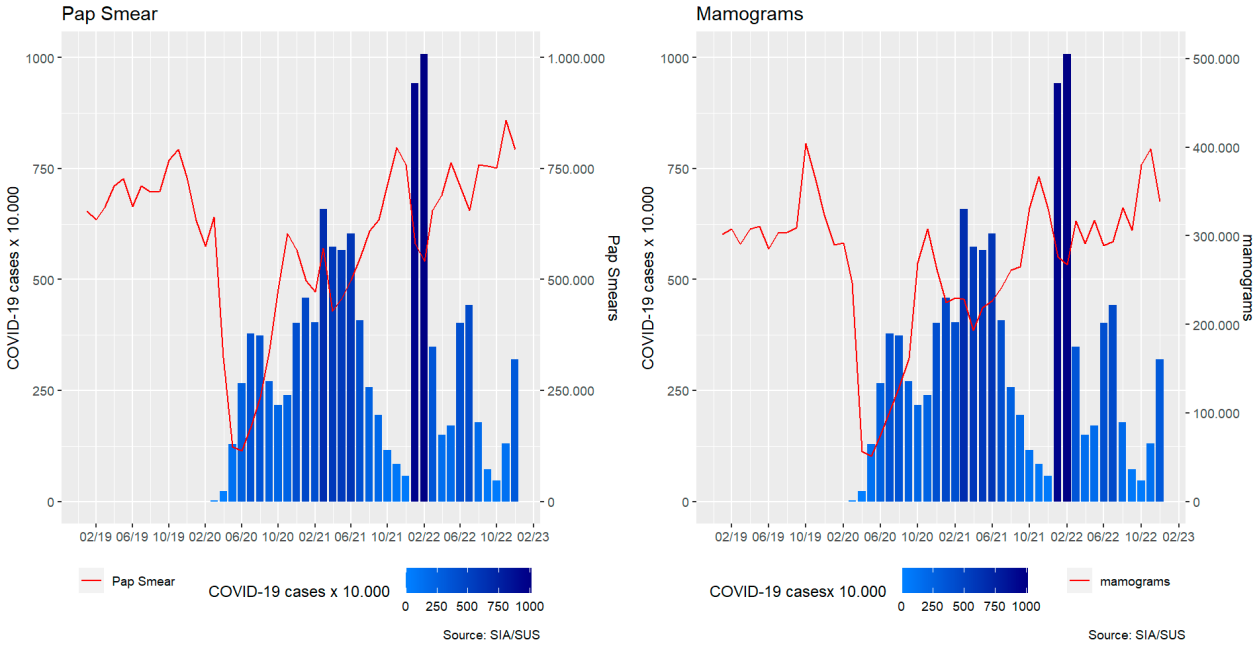


Figure 1. Number of cervix and breast cancer monitoring exams and confirmed COVID-19 cases according to year months. Brazil, 2019-2022

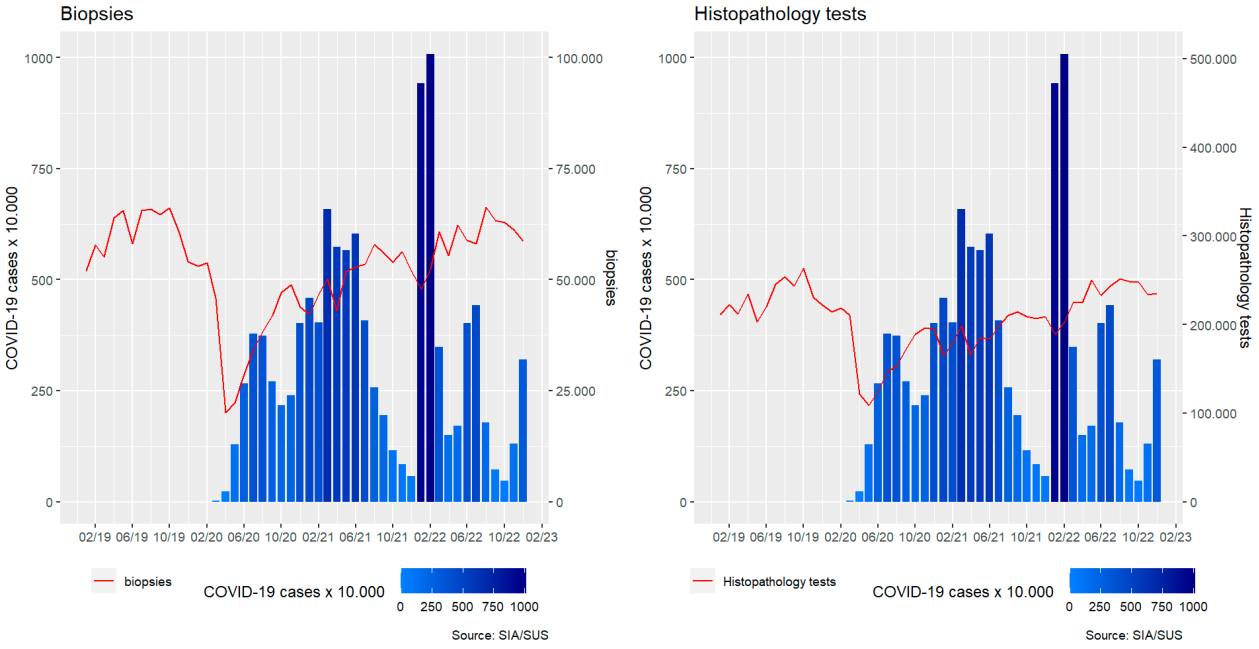


Figure 2. Number of biopsies and histopathological exams and confirmed COVID-19 cases according to year months. Brazil, 2019-2022

-11.06 to 0.73) and an increase from February 2022 to December 2022 (MPC=3.18, 95%CI 1.93 - 6.07), as shown in Figure 4.

For mammograms, six distinct trend change points were also identified, with significant reductions coinciding with periods of peak COVID-19 cases. Between February and May 2020, a reduction of 45.79% (CI 95%: -49.88 to -28.85) was observed in the mammogram records. In May 2020, the number of recorded mammograms decreased 83.4% in comparison with the same period in 2019. Then, there was a significant increase in the mammogram records from May to November 2020 (MPC 33.61%, 95%CI 25.17% - 45.53) as confirmed COVID-19 cases decreased. Small fluctuations occurred throughout 2021

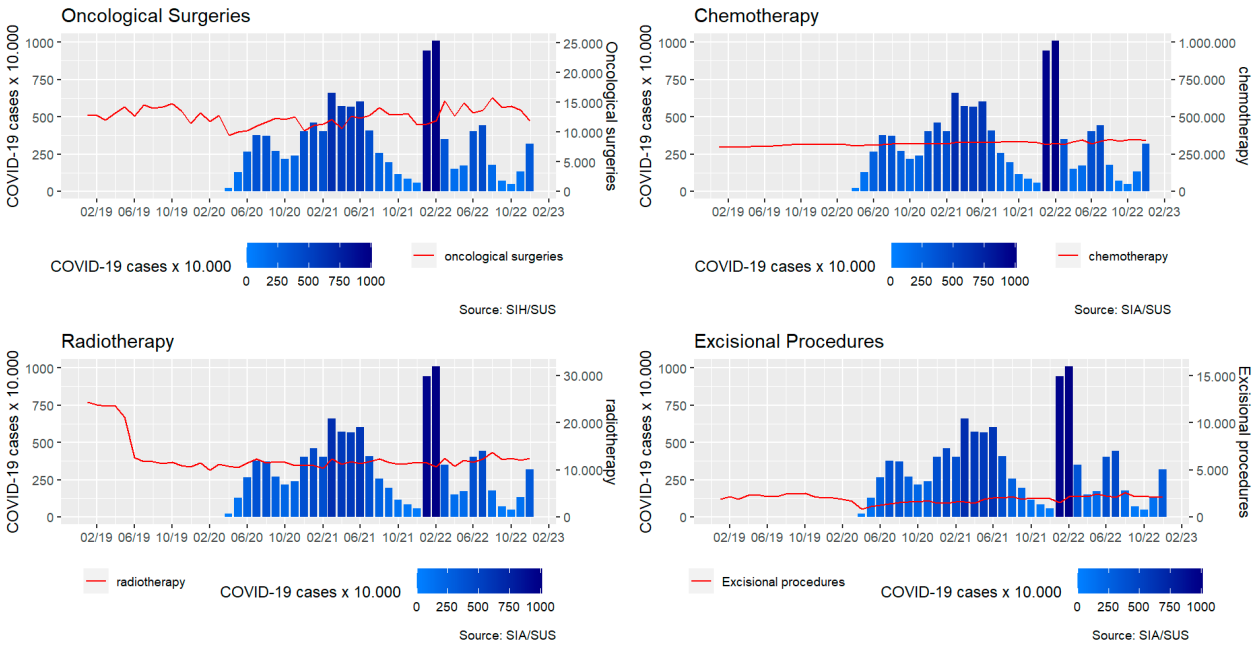


Figure 3. Number of cancer treatments and confirmed COVID-19 cases according to year months. Brazil, 2019-2022

and 2022, with a significant increase between February and December 2022 (MPC=3.07, 95%CI 1.22-7.72) (Figures 1 and 4).

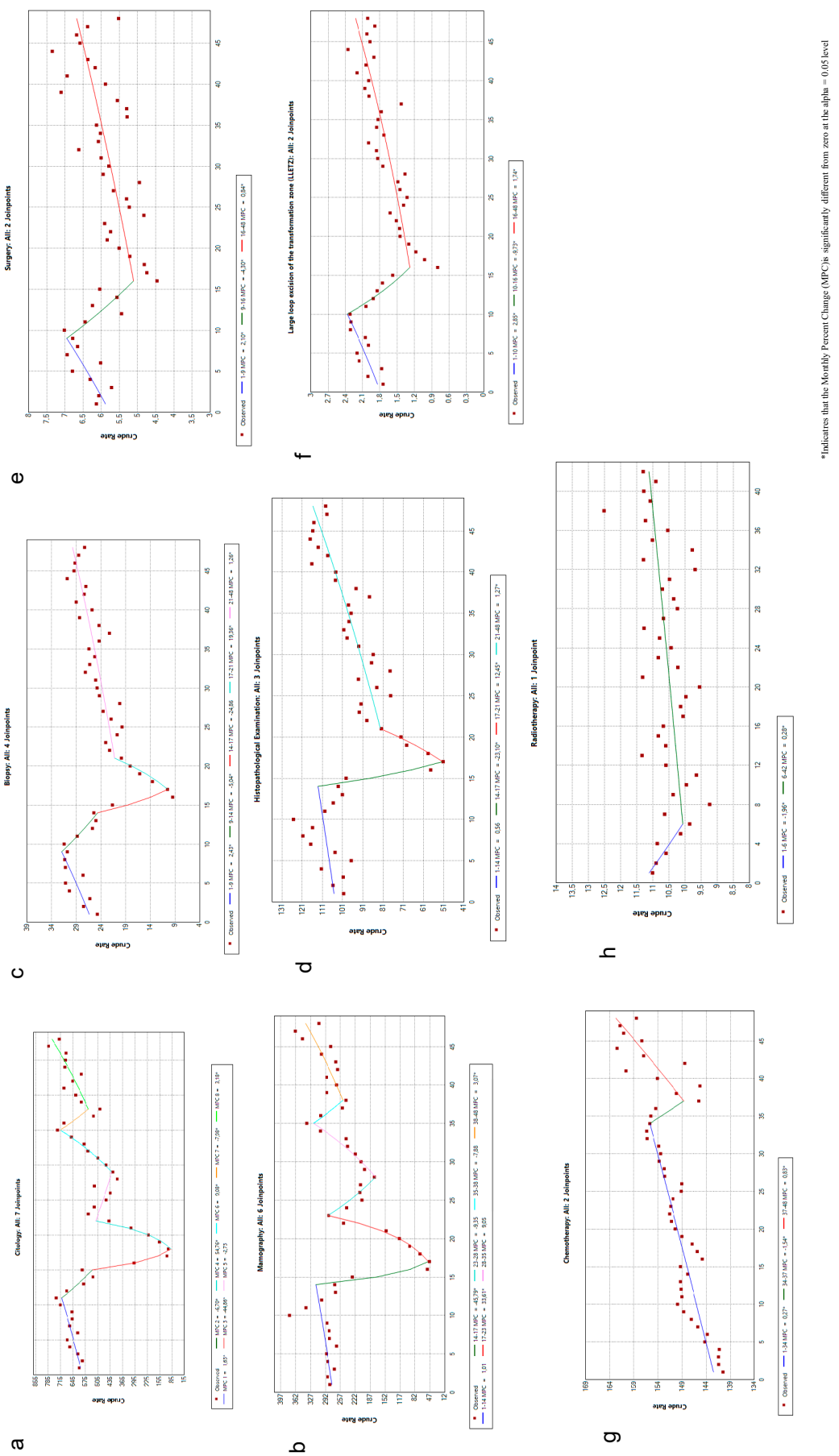
The biopsies for cancer diagnosis presented significant fluctuations during the analyzed period. April and May 2020 were the most negatively affected months, with a reduction of 68.6% and 66.0%, respectively, in comparison with the corresponding period in 2019. The drop in histopathological exams was less expressive, with a reduction of 48.1% and 46.6% in April and May 2020, respectively, in comparison with the same period in the previous year. At the end of the analyzed period, the number of diagnosis procedures was similar to before the pandemic. The number of biopsies performed in 2022 decreased 2.9% in comparison with 2019, while the number of histopathological exams increased 0.7% (Figure 2).

There was a significant increase of 2.43% (95%CI 0.55 - 6.97) from January to September 2019 in the provision of biopsies, followed by a reduction of 5.04% (95%CI -20,51% to - 1.03) from September 2019 to February 2020, and a non-significant reduction of 24.86% (95%CI -29.85 to - 19.83) from February to May 2020 (Figure 4c). A significant increase of 19.36% (95%CI 1.13 to 32.15) was observed from May to September 2020, followed by a 1.26% increase from September 2020 to December 2022 (Figure 4).

Oncological surgeries also declined significantly in the period analyzed. April and May 2020 were the most affected months, showing reductions of 24.6% and 26.1%, respectively, when compared to 2019. Although the number of surgeries in March 2022 increased 27.1% in comparison to March 2019, the increase was not consistent throughout 2022, resulting in 6.2% less surgeries until the end of the year when compared to 2019 (Figure 3). A significant increase in the surgery offer was observed from January to September 2019 (MPC 2.10, 95%CI 0.45 - 5.22), followed by a significant reduction between September 2019 and April 2020 (MPC -4.30, 95%CI -10.22 to 2.29) and a significant increase between April 2020 and December 2022 (MPC 0.84, 95%CI 0.59-1.13) (Figure 4). The same pattern was observed for treatment of lesions that lead to cervical cancer (Figure 4).

There was an increase in chemotherapy records during the pandemic period. In every month from 2021 to 2022, more chemotherapy procedures were recorded than in the corresponding months in 2019. At the end of each year, an increase was observed: 3.4% in 2020, 7.4% in 2021 and 9.3% in 2022, compared to 2019 (Figure 3). An increase trend was observed from January 2019 to October 2021 (MPC=0.27, 95%CI 0.22 to 0.35), followed by a significant reduction from October 2021 to January 2022 (MPC=1.54, 95%CI -2.18 to 0.02) and 0.83% increase (95%CI 0.54 to 1.59) from January to December 2022 (Figure 4).

An increase in the records of radiotherapy procedures in the pandemic period was observed, though no great fluctuations have been observed. Throughout the months of 2020 to 2022, the production of radiotherapy procedures did not present great fluctuations (Figure 3).



*Indicates that the Monthly Percent Change (MPC)is significantly different from zero at the alpha = 0.05 level

Figure 4. Rate trends of cancer screening procedures (a, b), diagnosis (c, d) and treatment (e, f, g, h) recorded in the Brazilian Health Information System, 2019-2022

A Joinpoint[22] was identified: there was a reduction from July to December 2019 (MPC -1.96 95%CI -7.13 to 0.005), followed by an increase from December 2019 to December 2022 (MPC 0.28 95%CI 0.16-0.55) (Figure 4).

DISCUSSION

The study revealed a significant impact of the COVID-19 pandemic in all the stages of cancer care in Brazil. The screening procedures were the most affected, with more significant reductions in May 2020: 84.2% for cytopathological exams for cervical cancer screening and 82% for mammograms. Diagnosis and treatment also suffered significant reductions, especially in surgery. Only chemotherapy suffered no reduction.

The data used in this study were obtained from the SUS information systems that, due to their administrative nature, may present flaws in the records, mainly in services that have other funding sources, in addition to the transfer of resources by the Ministry of Health. However, as it is an infrequent situation and equally affects the periods analyzed, this limitation does not compromise the analyses performed.

Though no interruption has occurred in cervix and breast cancer screening tests, there was a significant reduction in the volume of exams for a prolonged period. The data indicates that the production of exams did not return to pre-pandemic levels until February 2022. A simulation performed by Yong et al.[24] estimated that a six-month interruption in breast cancer screening could result in 310 additional diagnosed cases in advanced stages and 110 additional deaths by cancer in Canada from 2020 to 2029. Although the incidence of breast cancer in Brazil is lower than in Canada, it is worth observing that Brazil, in addition to having a bigger population, already presented difficulties in access to diagnosis and treatment of breast cancer, being able to suffer significant impacts as estimated by the Canadian study[25,26].

This study's results are consistent with the findings from a systematic review that correlated the COVID-19 pandemic and the global decline in cancer screening. From January to October 2020, there was a significant decline in breast and cervix cancer screening of 46.7% and 51.8%, respectively. The lowest points were observed in April 2020 for mammograms (-74.3%) and in March 2020 for pap smears and HPV DNA tests (-78.8%). For breast cancer and cervical cancer monitoring tests, the average decline was greater in Latin America than in North America[4].

Reduction in biopsies, consistent with the findings of other studies, was smaller than that observed in screening tests. In 2020, there was a 34.5% reduction in comparison with 2019, which is similar to the 37.3% reduction in cancer diagnosis tests from January to October 2020 reported in the meta-analysis by Angelini et al.[27]. This reduction in biopsies may have led to delays in cancer diagnosis, resulting in diagnosis in advanced stages of the disease. Moreover, due to the postponing of exams and diagnosis, it's possible that an increase in cases will happen in the next years.

Considering the observed results, there is a need for adopting measures that aim at offering screening tests and diagnosis investigation to meet the repressed and current demands. In Brazil, the Ministry of Health launched a financial incentive in December 2020 to increase the offer of cervix and breast cancer screening tests[28]. However, the expected results were not met due to a new wave of the pandemic, caused by the Omicron variant in the turn of 2020 to 2021, which resulted in an even greater decline in exams.

Incentive strategies to adhere to national screening guidelines, respecting periodicity, age group and advocated conducts, are intended to increase efficacy of actions and minimize damages induced by the reduction of services.

Despite the significant reduction in oncological surgeries and treatment of cervical precursor lesions during the pandemic, the record of chemotherapy procedures remained stable and even increased lightly in comparison to the pre-pandemic period. This unexpected result may be related to the availability of adjuvant therapies for postponed surgical cases. However, it contrasts with the results of a global data systematic review conducted by Teglia et al.[5], who identified a more significant decline in chemotherapy in comparison to radiotherapy.

The published recommendations encourage the use of radiotherapy, when appropriate, to postpone surgery and hospitalization[5]. However, changes in recording procedures during the second term of 2019 impaired the analysis of radiotherapy in this study. However, it was not possible to compare the first months of the pre-pandemic year with the initial months of the pandemic. Due to limited data, it is not clear if radiotherapy was affected during the decline period observed for the other procedures from March to May.

Modeling studies conducted mainly in high-income countries estimated long-term effects of the COVID-19 pandemic. According to Malagon et al.[29], interruptions to cancer treatment during the pandemic may result in a 2.0% increase in deaths by cancer in Canada from 2020 to 2030.

The study by Luo et al.[30] estimated that delaying health services for a year and treatment for 26 weeks would result in 1,719 additional deaths among the colorectal cancer patients in Australia from 2020 to 2044.

Modeling projections suggest that the interruption of the HPV vaccination campaign in the United States could lead to over 48,000 cases of NIC2/3 over the next 100 years. Approximately half of the projected cases are estimated to occur over the next 25 years. The model assumed that coverage would increase linearly from June 2021 to December 2021 and return to previous levels in January 2022[31]. A study conducted in Brazil revealed a reduction of 38.55% in the average number of HPV vaccine doses administered from March to September 2020 in comparison to 2019. Significant reductions were observed in regions with higher rates of cervical cancer, making these results particularly impacting[32].

Alagoz et al. estimated that breast cancer-related deaths cumulatively increased 0.52% from 2020 to 2030, in comparison to a scenario that excludes the pandemic interruptions. The authors reported 2,487 excess deaths by breast cancer, including 950 due to decrease in monitoring, 1,314 from delay in diagnosis of symptomatic patients and 151 due to reducing the use of chemotherapy in women with early-stage, hormone-positive cancer[33].

Although modeling studies have used scenarios from high-income countries, their results also serve as a warning for the situation in Brazil. Before the pandemic, Brazil already faced challenges in the organization of screening and access to diagnosis, in addition to long waiting periods to start cancer treatment[12,14,25].

Therefore, the post-pandemic efforts should concentrate in the organization of screening actions, confirmation of diagnosis and treatment of symptomatic cases suspected of cancer.

CONCLUSION

The pandemic had a profound impact in the Brazilian health system, leading to a significant reduction in actions of cancer control, mainly in screening breast and cervical cancer and diagnosing all types of cancer. Although the health system has shown plasticity and ability to resume cancer monitoring, diagnosis and treatment when the pandemic slowed down, the production volume only returned to pre-pandemic levels at the end of 2022. This means that diagnosis and treatment delayed by the pandemic can still generate impact in cancer incidence and mortality in the country in the following years.

CONTRIBUTIONS

Caroline Madalena Ribeiro has contributed to the study design, planning, acquisition, analysis and interpretation of the data, as well as the wording. Adriana de Tavares Moraes Atty has contributed to the study design, planning, and wording. Both authors approved the final version for publication.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interest to declare.

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None.

REFERENCES

1. Pradhan NA, Samnani AABA, Abbas K, tel. Resilience of primary healthcare system across low- and middle-income countries during COVID-19 pandemic: a scoping review. Health Res Policy Syst. 2023;21(1):98.
2. Tuczyńska M, Matthews-Kozanecka M, Baum E. Accessibility to non-Covid health services in the world during the Covid-19 pandemic: review. Front Public Health. 2021;9:760795. doi: https://doi.org/10.3389/fpubh.2021.760795
3. Ferrara P, Dallagiacoma G, Alberti F, et al. Prevention, diagnosis and treatment of cervical cancer: a systematic review of the impact of Covid-19 on patient care. Prev Med. 2022;164:107264.
4. Teglia F, Angelini M, Astolfi L, et al. Global Association of Covid-19 pandemic measures with cancer screening: a systematic review and meta-analysis. JAMA Oncol. 2022;8(9):1287-93.
5. Teglia F, Angelini M, Casolari G, et al. Global Association of COVID-19 pandemic measures with cancer treatment: a systematic review and meta-analysis. Cancers. 2022;14(22):5490.
6. Villain P, Carvalho AL, Lucas E, et al. Cross-sectional survey of the impact of the COVID-19 pandemic on cancer screening programs in selected low- and middle-income countries: study from the IARC COVID-19 impact study group. Int J Cancer. 2021;149(1):97-107.
7. Sott MK, Bender MS, Silva Baum K. Covid-19 outbreak in brazil: health, social, political, and economic implications. Int J Health Serv. 2022;00207314221122658.
8. Data WHO [Internet]. Geneva: WHO; 2020. Number of COVID-19 cases reported to WHO. [acesso 2024 fev 9]. Disponível em: https://data.who.int/dashboards/covid19/cases
9. Migowski A, Corrêa FM. Recommendations for early detection of cancer during covid-19 pandemic in 2021. Revista APS. 2020;23(1):241-6.
10. Gilardino RE, Valanzasca P, Rifkin SB. Has Latin America achieved universal health coverage yet? Lessons from four countries. Arch Public Health. 2022;80(1):1-11.

11. Migowski A, Atty ATM, Tomazelli JG, et al. 30 years of oncological care in the brazilian National Health System. Rev Bras Cancerol. 2018;64(2):247-50. doi: https://doi.org/10.32635/2176-9745.RBC.2018v64n2.84
12. Corrêa FM, Migowski A, Almeida LM, et al. Cervical cancer screening, treatment and prophylaxis in Brazil: current and future perspectives for cervical cancer elimination. Front Med. 2022;9. doi: https://doi.org/10.3389/fmed.2022.945621
13. Renna Junior NL, Silva GA. Temporal trend and associated factors to advanced stage at diagnosis of cervical cancer: analysis of data from hospital based cancer registries in Brazil, 2000-2012. Epidemiol Serv Saúde. 2018;27(1):e2017285. doi: https://doi.org/10.5123/S1679-49742018000100013
14. Oliveira NPD, Cancela MC, Martins LFL, et al. Spatial distribution of advanced stage diagnosis and mortality of breast cancer: socioeconomic and health service offer inequalities in Brazil. PLoS ONE. 2021;16(2):e0246333. doi: https://doi.org/10.1371%2Fjournal.pone.0246333
15. SIA-SUS: Sistema de Informações Ambulatoriais do SUS [Internet]. Brasília (DF): DATASUS. [data desconhecida] – [acesso 2024 ago 3]. Disponível em: http://sia.datasus.gov.br/principal/index.php
16. SIH-SUS: Sistema de Informações Hospitalares do SUS [Internet]. Brasília (DF): DATASUS. [data desconhecida] – [acesso 2024 ago 3]. Disponível em: https://datasus.saude.gov.br/acesso-a-informacao/morbidade-hospitalar-do-sus-sih-sus/
17. DATASUS: [Internet]. Brasília (DF): DATASUS. [data desconhecida]. Transferência de Arquivos [acesso 2024 fev 9]. Disponível em: https://datasus.saude.gov.br/transferencia-de-arquivos/
18. Instituto Brasileiro de Geografia e Estatística. Censo demográfico 2022: população e domicílios - primeiros resultados do universo. Rio de Janeiro: IBGE; 2022.
19. Painel Coronavírus [Internet]. Brasília, DF: Ministério da Saúde; 2023. [acesso 2024 out 9]. Disponível em: https://covid.saude.gov.br/
20. Ministério da Saúde (BR). Portaria no 263, de 22 de fevereiro de 2019. Atualiza os procedimentos radioterápicos da Tabela de Procedimentos, Medicamentos, Órteses, Próteses e Materiais Especiais do Sistema Único de Saúde (SUS). Diário Oficial da União, Brasília, DF. 2019 fev 25; Seção 1:75.
21. R: The R Project for Statistical Computing [Internet]. Version 3.4.3. [data desconhecida]: The R foundation. [acesso 2024 ago 3]. Disponível em: https://www.R-project.org/
22. Joinpoint Trend Analysis [Internet]. Version 5.0.2. Bethesda (MD): National Cancer Institute. 2020 abr 22 – [acesso 2024 ago 3]. Disponivel em: https://surveillance.cancer.gov/joinpoint/
23. Conselho Nacional de Saúde (BR). Resolução nº 510, de 7 de abril de 2016. Dispõe sobre as normas aplicáveis a pesquisas em Ciências Humanas e Sociais cujos procedimentos metodológicos envolvam a utilização de dados diretamente obtidos com os participantes ou de informações identificáveis ou que possam acarretar riscos maiores do que os existentes na vida cotidiana, na forma definida nesta Resolução [Internet]. Diário Oficial da União, Brasília, DF. 2016 maio 24 [acesso 2024 ago 3]; Seção I:44. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/cns/2016/res0510_07_04_2016.html
24. Yong JH, Mainprize JG, Yaffe MJ, et al. The impact of episodic screening interruption: COVID-19 and population-based cancer screening in Canada. J Med Screen. 2021;28(2):100-7.
25. Renna Junior NL, Silva GA. Late-Stage diagnosis of breast cancer in Brazil: analysis of data from hospital-based cancer registries (2000-2012). Rev Bras Ginecol Obstet. 2018;40(3):127-36. doi: https://doi.org/10.1055/s-0038-1624580
26. Medeiros GC, Thuler LCS, Bergmann A. delay in breast cancer diagnosis: a brazilian cohort study. Public Health. 2019;167:88-95.
27. Angelini M, Teglia F, Astolfi L, et al. Decrease of cancer diagnosis during Covid-19 pandemic: a systematic review and meta-analysis. Eur J Epidemiol. 2023;38(1):31-8.
28. Ministério da Saúde (BR). Portaria GM/MS Nº 3.712, de 22 de dezembro de 2020. Institui, em caráter excepcional, incentivo financeiro federal de custeio para o fortalecimento do acesso às ações integradas para rastreamento, detecção precoce e controle do Câncer no Sistema Único de Saúde. [Internet]. Diário Oficial da União, Brasília, DF. 2020 dez 23; Edição: 245; Seção: 1:98. Disponível em: https://www.in.gov.br/web/dou/-/portaria-gm/ms-n-3.712-de-22-de-dezembro-de-2020-295788198
29. Malagón T, Yong JHE, Tope P, et al. Predicted long-term impact of Covid-19 pandemic-related care delays on cancer mortality in Canada. Int J Cancer. 2022;150(8):1244-54.
30. Luo Q, O'Connell DL, Yu XQ, et al. Cancer incidence and mortality in Australia from 2020 to 2044 and an exploratory analysis of the potential effect of treatment delays during the Covid-19 pandemic: a statistical modelling study. Lancet Public Health. 2022;7(6):e537-48.
31. Daniels V, Saxena K, Roberts C, et al. Impact of reduced human papillomavirus vaccination coverage rates due to COVID-19 in the United States: a model based analysis. Vaccine. 2021;39(20):2731-5.

32. Silva TMRD, Nogueira de Sá ACMG, Beinner MA, et al. Impact of the Covid-19 pandemic on human papillomavirus vaccination in Brazil. Int J Public Health. 2022;67:1604224.
33. Alagoz O, Lowry KP, Kurian AW, et al. Impact of the COVID-19 pandemic on breast cancer mortality in the us: estimates from collaborative simulation modeling. J Natl Cancer Inst. 2021;113(11):1484-94.

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