



Impact of the COVID-19 pandemic on the diagnosis of lung cancer in northeastern Brazil

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TO THE EDITOR:

Lung cancer is the most lethal and one of the most common cancers in both men and women. More than 35,000 deaths and 30,000 new cases occurred in Brazil in 2020. Ceará, a state in northeastern Brazil, has the sixth highest incidence of lung cancer in the country.⁽¹⁾

At the end of 2019, SARS-CoV-2 infection began to advance rapidly. By March of 2022, SARS-CoV-2 had infected approximately 30 million people in Brazil, with more than 3 million cases and almost 27,000 deaths in the state of Ceará. The city of Fortaleza, one of the seven largest capitals in Brazil, had the second highest mortality rate in the first year of the COVID-19 pandemic in the country, second only to that in the city of Manaus.⁽²⁾

The COVID-19 pandemic demanded urgent adaptation of health care services. There was a decrease in clinical appointments, diagnostic procedures, and hospitalizations for other diseases. The flow of care was changed at health care facilities, and hospital beds were reserved for COVID-19 patients: a challenging scenario for the diagnosis of cancer.

The reduction in screening tests and diagnostic procedures impacted incidence rates, with a significant drop in the diagnosis of new cancer cases worldwide.⁽³⁾ In Brazil, at least 15,000 cancer cases went undiagnosed per month in 2020. The northeastern region of the country was the most affected, with a 42.7% reduction in the mean number of monthly diagnoses.⁽⁴⁾

With regard to lung cancer in particular, the numbers of bronchoscopies and lung biopsies performed in the Brazilian Unified Health Care System between March and May of 2020 decreased significantly, by 35% and 13%, respectively, when compared with those for the same period in the previous year. Hospital admissions for lung cancer also dropped significantly (by 7%) over the same period.⁽⁵⁾ Although the recommendation was that treatments that confer a survival benefit should continue to be provided whenever possible,⁽⁶⁾ the readjustment and overload of the Brazilian Unified Health Care System during the COVID-19 pandemic seem to have delayed the diagnosis and treatment of lung cancer.

In addition to having an impact on the incidence of cancer, the COVID-19 pandemic in England resulted in a significant increase in the number of preventable deaths resulting from late diagnosis of various types of

cancer.⁽⁷⁾ Patients with lung cancer were shown to be at a greater risk for pandemic-related care delays than were those with other malignancies.⁽⁸⁾ Furthermore, after the beginning of the COVID-19 pandemic, patients presented with more advanced disease at the time of diagnosis.⁽⁹⁾

In the present study, we evaluated the impact of the COVID-19 pandemic on the diagnosis of lung cancer. Data were collected retrospectively from the files of the surgical pathology department of the *Hospital de Messejana*, located in the city of Fortaleza, Brazil. Our study was approved by the local research ethics committee (Protocol no. CAAE 52992721.0.0000.5039). The surgical pathology reports were identified by sequential numbers by sign-out date. Patient anonymity and confidentiality were strictly maintained. Data were also collected from publicly available anonymized hospital records.⁽¹⁰⁾

The *Hospital de Messejana* is a referral hospital for thoracic diseases in the northern and northeastern regions of Brazil, playing a major role in lung cancer screening and management. Between 2018 and 2021, the hospital accounted for approximately 90% of all bronchoscopies performed in the state of Ceará and more than 80% of all hospitalizations for investigation and surgical treatment of lung cancer in the state.⁽¹⁰⁾

As of June of 2020, because of the COVID-19 pandemic, the *Hospital de Messejana* medical wards and ICUs were adapted to receive patients with COVID-19. As a result, there was a reduction in the number of diagnostic procedures for other diseases. The surgical pathology department of the hospital received a significantly lower number of samples for analysis in 2020 and 2021. Consequently, the numbers of surgical pathology reports issued in 2020 and 2021 decreased significantly in comparison with those of reports issued before the COVID-19 pandemic (Figure 1A).

Between 2015 and 2019, 3,703 ± 70 surgical pathology reports were issued annually. In 2020 and 2021, the numbers of reports issued were 2,748 and 2,899, respectively. The greatest reduction was observed in 2020. May was the most affected month, followed by June and April, coinciding with the peak months of the first wave of the COVID-19 pandemic in the state of Ceará. In 2021, although there was a slight improvement in the total number of examinations in comparison with 2020,

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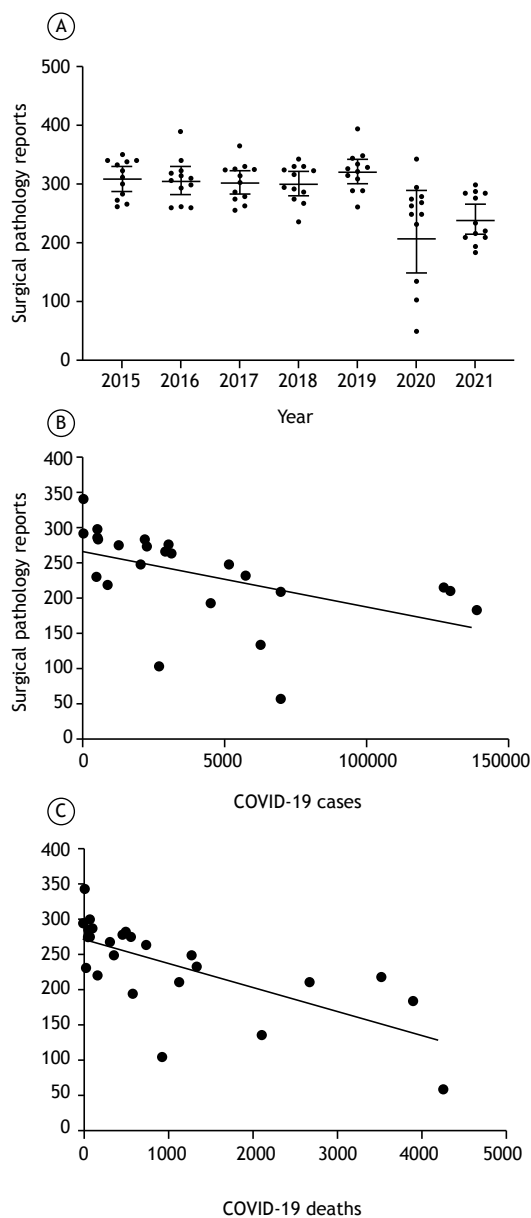


Figure 1. Numbers of surgical pathology reports issued by pathologists at the *Hospital de Messejana* before and during the COVID-19 pandemic, and their relationship with the total numbers of COVID-19 cases and deaths in the state of Ceará, Brazil. In A, surgical pathology reports issued between 2015 and 2021. Each dot represents the number of reports issued each month. There was a significant reduction in the numbers of reports issued in 2020 and 2021 in comparison with those issued in the 2015-2019 period ($p < 0.05$). There was no significant difference between the numbers of reports issued in 2020 and 2021. In B and C, linear relationship of the numbers of surgical pathology reports issued by pathologists at the Hospital de Messejana with the numbers of COVID-19 cases (B) and deaths (C) occurring between January of 2020 and December of 2021. Each dot represents one month in the analyzed period.

there was no significant recovery. As can be seen in Figure 1B, there was a strong negative correlation between the number of surgical pathology reports and

the number of COVID-19 cases ($r(22) = -0.502$; $p = 0.012$), as well as between the number of surgical pathology reports and the number of deaths from COVID-19 ($r(22) = -0.689$; $p = 0.002$).

The mean number of bronchoscopies performed monthly at the *Hospital de Messejana* in 2020 and 2021 was 47.61, which was 44% lower than those for 2018 and 2019, before the COVID-19 pandemic ($p = 0.0006$). Statistically significant reductions were also seen in the numbers of surgical pathology reports on the lungs, trachea, pleura, and mediastinal lymph nodes, as well as in the number of hospitalizations for the diagnosis and management of lung cancer (International Classification of Diseases, 10th revision codes C33 and C34), which decreased by 17% ($p = 0.006$) and 21% ($p = 0.005$), respectively.

The positivity rate (i.e., the ratio of the total number of cancer cases to the total number of surgical pathology reports) did not change during the COVID-19 pandemic. In 2020 and 2021, the mean proportion of positive cases or strongly suspected cases of malignancy for biopsies performed in the lungs, pleura, trachea, and mediastinal lymph nodes was 48.6%, which is not significantly different from the positivity rates for 2018 and 2019 (48.2%; $p = 0.75$). However, fewer cases were diagnosed, because of the negative impact of COVID-19 on the total number of biopsies analyzed.

For non-small cell lung carcinoma, which is the predominant histological type, the 5-year survival rate is reduced by almost half in cases of locally advanced tumors in comparison with those diagnosed at an earlier stage, being equal to 37%. The 5-year survival rate is even lower in advanced stages, dropping to an alarming 8%.⁽¹¹⁾ This underscores the negative impact that a reduction in the diagnosis of lung cancer at the *Hospital de Messejana* during the pandemic years of 2020 and 2021 can have on prognosis and cure rates.

The state of Ceará, as well as several other regions of the world, will face a great challenge. Patients who failed to receive a diagnosis during the pandemic years of 2020 and 2021 are likely to present with more advanced disease at diagnosis, with worse prognosis and lower mean survival rates. There is an urgent need for restructuring the health care system (with the return of early detection programs) and preparing specialized centers to manage the backlog of patients with lung cancer.

In Brazil, lung cancer is the leading cause of cancer death among men and the second leading cause of cancer death among women. Therefore, there is a need for campaigns promoting early diagnosis of lung cancer, similar to the Prostate Cancer Awareness Month and the Breast Cancer Awareness Month campaigns. Increased education on lung cancer, together with an increased availability of outpatient visits, diagnostic tests, and surgical procedures for lung cancer, could mitigate the impact of the COVID-19 pandemic on lung cancer screening and management.

AUTHOR CONTRIBUTIONS

All of the authors contributed equally to the conception of the study, as well as the drafting, revision, and approval of the manuscript.

CONFLICTS OF INTEREST

None declared.

REFERENCES

1. Brasil. Ministério da Saúde. Instituto Nacional do Câncer (INCA) [homepage on the Internet]. Rio de Janeiro: INCA; c2022 [cited 2022 Apr 6]. Estatística do cancer. Available from: <https://www.inca.gov.br/numeros-de-cancer>
2. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde [homepage on the Internet]. Brasília: Ministério da Saúde; c2022 [cited 2022 Apr 8]. Painel Coronavírus. Available from: <https://covid.saude.gov.br/>
3. Kaufman HW, Chen Z, Niles J, Fesko Y. Changes in the Number of US Patients With Newly Identified Cancer Before and During the Coronavirus Disease 2019 (COVID-19) Pandemic [published correction appears in JAMA Netw Open. 2020 Sep 1;3(9):e2020927]. *JAMA Netw Open*. 2020;3(8):e2017267. <https://doi.org/10.1001/jamanetworkopen.2020.17267>
4. Marques NP, Silveira DMM, Marques NCT, Martelli DRB, Oliveira EA, Martelli-Júnior H. Cancer diagnosis in Brazil in the COVID-19 era. *Semin Oncol*. 2021;48(2):156-159. <https://doi.org/10.1053/j.seminoncol.2020.12.002>
5. Araujo-Filho JAB, Normando PG, Melo MDT, Costa AN, Terra RM. Lung cancer in the era of COVID-19: what can we expect?. *J Bras Pneumol*. 2020;46(6):e20200398. <https://doi.org/10.36416/1806-3756/e20200398>
6. Aran V, De Marchi P, Zamboni M, Ferreira CG. Dealing with lung cancer in the COVID-19 scenario (A review). *Mol Clin Oncol*. 2021;14(2):27. <https://doi.org/10.3892/mco.2020.2189>
7. Maringe C, Spicer J, Morris M, Purushotham A, Nolte E, Sullivan R, et al. The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study [published correction appears in *Lancet Oncol*. 2021 Jan;22(1):e5]. *Lancet Oncol*. 2020;21(8):1023-1034. [https://doi.org/10.1016/S1470-2045\(20\)30388-0](https://doi.org/10.1016/S1470-2045(20)30388-0)
8. Bhalla S, Bakouny Z, Schmidt AL, Labaki C, Steinharter JA, Tremblay DA, et al. Care disruptions among patients with lung cancer: A COVID-19 and cancer outcomes study. *Lung Cancer*. 2021;160:78-83. <https://doi.org/10.1016/j.lungcan.2021.07.002>
9. Reyes R, López-Castro R, Auclin E, García T, Chourio MJ, Rodriguez A, et al. Impact of COVID-19 Pandemic in the Diagnosis and Prognosis of Lung Cancer. *J Thorac Oncol*. 2021;16(3):S141. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1556086421002616> <https://doi.org/10.1016/j.jtho.2021.01.219>
10. Secretaria da Saúde do estado do Ceará (SESA) [homepage on the Internet]. Fortaleza: SESA; c2022 [cited 2022 Feb 9]. Sistema de Informações Hospitalares Available from: <https://www.saude.ce.gov.br/tabnet-ceara/sih/>
11. American Cancer Society [homepage on the Internet]. Atlanta: American Cancer Society; c2022 [cited 2022 Apr 6]. Lung Cancer Survival Rates. Available from: <https://www.cancer.org/cancer/lung-cancer/detection-diagnosis-staging/survival-rates.html>