Analysis of Salivary Gland Cancer before and during the COVID-19 Pandemic in Brazil

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Análise do Câncer de Glândula Salivar antes e durante a Pandemia de Covid-19 no Brasil

Análisis del Cáncer de Glándulas Salivales antes y durante la Pandemia de COVID-19 en el Brasil

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ABSTRACT

Introduction: The COVID-19 pandemic has harmed health services, including delays in diagnosing and beginning of cancer treatment. **Objective:** To analyze and compare the number of salivary gland cancer (SGC) case registrations, staging and time to start treatment (TT) from 2019 to 2022 in Brazil. **Method:** Data on SGC registrations, gender, age group, type of treatment, staging, and TT were collected from the Oncology Panel. A descriptive analysis of the variables was carried out and the Friedman test was used to compare the number of SGC, staging, and TT records of the years analyzed ($p < 0.05$), using SPSS v.22.0. **Results**: For the period investigated, SGC records were more prevalent in males from the fifth decade of life onwards; surgery and radiotherapy were the most frequent therapeutic modalities, and stages IV and III were the most prevalent whenever staging was recorded. TT < 30 days was predominant in all periods, followed by TT > 60 days. SGC, staging and TT records showed median variations between pre- and trans-pandemic periods, but without statistically significant differences ($p > 0.05$). **Conclusion**: No significant differences were identified in SGC, staging, and TT records in Brazilian states before and during the COVID-19 pandemic. These results suggest that the Brazilian public health system managed to maintain consistent cancer care, even during the COVID-19 pandemic.

Key words: Mouth Neoplasms; Salivary Glands Neoplasms; Time to Treatment; COVID-19.

RESUMO

Introdução: A pandemia de covid-19 gerou impacto negativo na prestação de serviços de saúde, incluindo atrasos no diagnóstico e no início do tratamento do câncer. **Objetivo:** Analisar e comparar o número de registros de casos de câncer de glândulas salivares (CGS), estadiamentos e tempo para o início de tratamento (TT) de 2019 a 2022 no Brasil. **Método:** Os dados sobre o registro de CGS, sexo, faixa etária, tipo de tratamento, estadiamento e TT foram coletados do Painel-Oncologia. Foi realizada análise descritiva das variáveis e o teste de Friedman foi utilizado para comparar o número de registros de CGS, estadiamento e TT entre os anos analisados (p<0,05), utilizando SPSS v.22.0. **Resultados:** Para todos os anos analisados, os registros de CGS foram mais prevalentes no sexo masculino a partir da quinta década de vida; cirurgia e radioterapia foram as modalidades terapêuticas mais utilizadas; e os estágios IV e III foram os mais prevalentes sempre que o estadiamento foi registrado. O TT <30 dias foi predominante em todos os períodos, seguido do TT >60 dias. Os registros de CGS, estadiamento e TT apresentaram variações medianas entre os períodos pré e transpandêmico, mas sem diferenças estatisticamente significativas (p>0,05). **Conclusão:** Não foram identificadas diferenças significativas nos registros de CGS, estadiamento e TT nos Estados brasileiros, antes e durante a pandemia de covid-19. Esses resultados sugerem que o sistema público de saúde brasileiro conseguiu manter a consistência da assistência oncológica, mesmo durante a pandemia de covid-19.

Palavras-chave: Neoplasias Bucais; Neoplasias das Glândulas Salivares; Tempo para o Tratamento; COVID-19.

RESUMEN

Introducción: La pandemia de COVID-19 ha tenido un impacto negativo en la prestación de servicios sanitarios, incluyendo retrasos en el diagnóstico e inicio del tratamiento del cáncer. **Objetivo:** Analizar y comparar el número de registros de casos de cáncer de glándulas salivales (CGS), la estadificación y el tiempo para iniciar el tratamiento (TT) de 2019 a 2022 en el Brasil. **Método:** Los datos sobre registros de CGS, género, grupo de edad, tipo de tratamiento, estadificación y TT fueron recogidos del Panel de Oncología. Se realizó un análisis descriptivo de las variables y se utilizó la prueba de Friedman para comparar el número de registros de CGS, estadificación y TT entre los años analizados (p<0,05), utilizando SPSS v.22.0. **Resultados:** Para todos los años analizados, los registros de CGS fueron más prevalentes en varones a partir de la quinta década de vida; la cirugía y la radioterapia fueron las modalidades terapéuticas más utilizadas; y los estadios IV y III fueron los más prevalentes siempre que se registró estadificación. El TT <30 días predominó en todos los periodos, seguido del TT >60 días. Los registros de CGS, estadificación y TT mostraron variaciones medianas entre los periodos pre y transpandémico, pero sin diferencias estadísticamente significativas (p>0,05). **Conclusión:** No se identificaron diferencias significativas en los registros de CGS, estadificación y TT en los estados brasileños antes y durante la pandemia de COVID-19. Estos resultados sugieren que el sistema de salud pública brasileño consiguió mantener la coherencia de la atención oncológica, incluso durante la pandemia de COVID-19.

Palabras clave: Neoplasias de la Boca; Neoplasias de las Glándulas Salivales; Tiempo de Tratamiento; COVID-19.

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INTRODUCTION

Salivary gland tumors are rare pathologies and only around 20% of these tumors are considered malignant[1]. The estimated incidence of salivary gland cancer (SGC) is 1.2 to 1.3 cases per 100,000 individuals. This type of cancer, although uncommon, still accounts for nearly 3% of all head and neck cancers[1].

In 2020, 53,583 new SGC cases were diagnosed worldwide[2]. Of these, 51.41% in men, 54.54% in older adults and 22,778 deaths were related to this malignant neoplasm[2]. Recent studies have corroborated these trends by indicating the higher prevalence in males and higher incidence around the fifth and sixth decade of life[3,4].

Several environmental factors have been associated with the development of SGC, as exposure to ionizing radiation, mainly associated with certain specific occupations that involve contact with radioactive materials and nickel compounds, as well as smoking and alcohol consumption[5]. Besides these, other potential risk factors as dietary habits and obesity[6] have been identified.

Mucoepidermoid carcinoma is the most common histologic type in the salivary glands, accounting for approximately 30% of all malignancies in this anatomic site[7]. Other types of malignant neoplasms, as adenoid cystic carcinoma, epithelial-myoepithelial carcinoma, carcinoma ex-pleomorphic adenoma, and salivary duct carcinoma, can also affect salivary glands[8]. They usually display an increased volume in the affected region that progresses slowly, often without apparent symptoms. However, it may be associated with the formation of superficial oral ulcers and pain due to compression of nerve structures and paresthesia[9,10].

Slow growth and the absence of symptoms often lead to delays in diagnosis, resulting in advanced stages of the disease[8], which directly impact prognosis and therapeutic management, revealing lower survival rates[11]. Therefore, early detection of precancerous lesions or early-stage cancers is critical, as it increases the curative likelihood and significantly reduces mortality and morbidity rates[12].

In the context of the COVID-19 pandemic, the isolation and social distancing restrictions adopted to contain the disease's spread adversely affected the health system and the early detection and diagnosis of several cancer types[13,14], resulting in a sizeable decline of screening, appointments, therapies, and surgeries[15]. As SGC can be slow-growing and asymptomatic, delayed diagnoses may have occurred, especially in the early stages and, consequently, in treatment. Their low incidence is assumed to have influenced the lack of exclusive data on these malignant neoplasms during the pandemic[16]. Given this gap, it is essential to carry out studies that address the epidemiologic aspects of SGC records in this period.

Therefore, this study aimed to analyze and compare how COVID-19 pandemic has affected SGC registrations, staging, and time to treatment initiation in Brazil from 2019 to 2022.

METHOD

Ecological, longitudinal, descriptive, and analytical study with secondary data from SGC records before (2019) and during the COVID-19 pandemic in Brazil (2020, 2021, and 2022). Data were collected for the full years.

The pandemic in Brazil consisted in three different waves: the first, from February 23 to November 7, 2020, the second, more prolonged and fatal, from November 8, 2020 to December 25, 2021 and the third, the shortest, lasting from December 26, 2021 to May 2022[17-18]. Secondary public data were obtained from Panel-Oncology of the computer department of the National Health System (Tabnet-DATASUS)[19] . This platform was created to monitor the compliance with Law number 12,732[20] of November 22, 2012, the 60-days law, which establishes the time to begin treatment by SUS for patients with a confirmed diagnosis of malignant neoplasm.

The Panel-Oncology data[19] are obtained from various national hospital information sources, including the outpatient information system (SIA), through the individualized outpatient production bulletin (BPA-I), the high complexity procedure authorization (APAC) from the hospital information system (SIH) and the cancer information system (SISCAN). DATASUS, under the coordination of the Ministry of Health, processes this information.

Data from the 26 Brazilian states and the Federal District were collected from 2019 to 2022. The 2019, 2020, and 2021 data were collected on February 24, 2023, and of 2022, on December 15, 2023. The variables were categorized by anatomical site: parotid gland (code C07 of the ICD-10 classification) and other unspecified major salivary glands (code C08 of the ICD-10 classification); Brazilian region (North, Northeast, Southeast, South and Midwest); sex (female and male); age group (0-19, 20-29, 30-39, 40-49,50-59,60-69, 70-70 and 80 years or older), therapeutic modality (surgery, radiotherapy, chemotherapy and both), staging (0, I, II, III, IV and not applicable), and time to start treatment (TT) (<30 days, 31-60 days and >60).

TT refers to the time interval in days between the date of the diagnostic examination and the date when treatment initiated, the confirmation of the diagnosis is based on the results of the anatomopathological examinations.

For cases where the first treatment was chemotherapy, radiotherapy, or both, an identified staging is assigned based on the conventional classification of cancer staging by the International Union for Cancer Control (UICC) as 0, I, II, III, and IV. The category "not applicable" is assigned to cases treated with surgery alone.

A descriptive analysis was performed with absolute and relative frequencies, medians, and percentiles. The Kolmogorov-Smirnov test was conducted to verify the normality of the total records of SGC, staging and TT. Since the data were nonparametric ($p < 0.0001$), the Friedman test was performed to compare the total number of records of SGC, staging, and TT variables by pairs of years analyzed (2019-2020, 2019-2021, 2019-2022, 2020-2021, 2020-2022, 2021-2022), considering $p < 0.05$. For this purpose, the Statistical Package for Social Sciences (SPSS)[21], version 22.0 (IBM SPSS Statistics for Windows, Armonk, NY) was used. Unreported or ignored data were not included in this analysis.

The review by the Ethics Committee was waived because only secondary, public and deidentified data were utilized in compliance with Directive number 510[22], April 7, 2016, of the National Health Council.

RESULTS

The total number of SGC records before the pandemic (2019) was 2,043. In 2020, dropped to 1,680. In 2021, a slight increase was observed (1,789), but pre-pandemic results (n=2,054) were only recorded in 2022. Malignant parotid neoplasia remained the most prevalent in all years (69.46%, 71.07%, 72%, 73.47%). In 2019, the Northeast region (36.56%) led the way in terms of the number of cases registered, while in subsequent years, the Southeast had the highest number of registrations (34.58%, 34.38%, 34.47%). Males were the most prevalent in all periods analyzed (50.51%, 56.79%, 53.44%, 54.24%). In 2019, the 50-59 age group was the most prevalent (22.12%), but the 60-69 age group was the most affected (24.94%, 24.48%, 23.71%) in the last three years. In all the years analyzed, surgery as first treatment was the most used therapeutic modality (36.81%, 34.35%, 36.89%, 36.81%), followed by radiotherapy (24.28%, 29.88%, 28.40%, 28.43%). The "not applicable" staging classification was the most common in the four periods investigated herein (36.81%, 34.35%, 36.89%, 36.81%). Stage IV was the most prevalent (12.43%, 17.02%, 13.36%, 14.56%) where staging was assigned, and TT <30 days remained the most recorded throughout all the years (39.35%, 37.80%, 39.97%, 39.58%) (Table 1).

The median number of SGC records dropped from 2019 (42.00) to 2020 (31.00). Successive increases in the median were observed in the following years 2021 (35.00) and 2022 (39.00), but without statistically significant difference ($p = 0.119$) (Table 2).

An increase in the median of stages IV was observed from 2019 (4.00) to 2020 (7.00), while the median of "not applicable" staging classification records fell from 2019 (14.00) to 2020 (8.00). However, there was no statistical difference in staging classifications ($p > 0.05$) in the periods analyzed (Table 2).

In regard to TT, a reduction in median records was observed for SGC treated within 30 days from 2019 (14.00) to 2020 (11.00) and increase in 2021 (13.00). TT> 60 days showed a reduction from 2019 (10.00) to 2020 (9.00) and an increase in 2021 (11.00) and a reduction in 2022 (9.00). Again, no statistical difference was observed in the record of time intervals analyzed over time and TT ($p > 0.05$) (Table 2).

DISCUSSION

Despite discrepancies in median records among the pre-and trans-pandemic periods, no significant differences were identified in SGC records, staging, and TT in Brazilian states.

The change of the number of SGC records in Brazil, characterized by a lower frequency of cases from 2019 to 2020, can be explained by the functioning of primary and secondary health systems overwhelmed by COVID-19 patients during the initial wave, where individuals with COVID-19-unrelated symptoms were discouraged to seek medical care[23,24]. Moreover, the Brazilian dental service was only functioning in urgent and emergency cases[25] and the detection of lesions in the oral cavity may have been further restricted.

The study by Schoonbeek et al.[26] indicated a reduction in head and neck cancer prevalence in the Netherlands during the initial COVID-19 outbreak in 2020, with a decrease of almost 25% against 2018 and 2019. This decline was most notable in oral and laryngeal carcinomas[26], similar to the decrease of SGC records in 2020 according to the present study. However, the second (2021) and third (2022) pandemic waves pointed to increased SGC registrations, showing a possible recovery as healthcare services were normalized.

The findings of this study showed that the parotid gland was the anatomical site with the highest number of records in all the periods reported. Similar proportions were found by Nachtsheim et al.[4] (75%), Ito et al.[27] (67.7%), and Goldenberg et al.[28] (74%). However, Fu et al.[29] and Iwata et al.[30] found lower prevalence rates than those observed in this study, 54% and 51.9%, respectively.

Table 1. Descriptive analysis of demographic and clinical characteristics of SGC registries in Brazil from 2019 to 2022

Variables	2019	2020	2021	2022
Anatomical site				
Parotid gland	1,419 (69.46%)	1,194 (71.07%)	1,288 (72.00%)	1,509 (73.47%)
Other primary and unspecified salivary glands	624 (30.54%)	486 (28.93%)	501 (28.00%)	545 (26.53%)
Regions				
North	55 (2.69%)	54 (3.21%)	50 (2.79%)	57 (2.78%)
Northeast	747 (36.56%)	489 (29.11%)	577 (32.25%)	691 (33.64%)
Southeast	682 (33.38%)	581 (34.58%)	615 (34.38%)	708 (34.47%)
South	443 (21.68%)	435 (25.89%)	440 (24.59%)	491 (23.90%)
Midwest	116 (5.68%)	121 (7.20%)	107 (5.98%)	107 (5.21%)
Sex				
Female	1,011 (49.49%)	726 (43.21%)	833 (46.56%)	940 (45.76%)
Male	1,032 (50.51%)	954 (56.79%)	956 (53.44%)	1,114 (54.24%)
Age group				
0-19	53 (2.59%)	50 (2.98%)	56 (3.13%)	58 (2.82%)
20-29	104 (5.09%)	55 (3.27%)	94 (5.25%)	90 (4.38%)
30- 39	182 (8.91%)	132 (7.86%)	147 (8.22%)	142 (6.91%)
40-49	282 (13.80%)	196 (11.67%)	229 (12.80%)	258 (12.56%)
50-59	452 (22.12%)	334 (19.88%)	352 (19.68%)	457 (22.25%)
60-69	448 (21.93%)	419 (24.94%)	438 (24.48%)	487 (23.71%)
70-79	342 (16.74%)	307 (18.27%)	295 (16.49%)	345 (16.80%)
80 or more	180 (8.81%)	187 (11.13%)	178 (9.95%)	217 (10.56%)
Therapeutic modality				
Surgery	752 (36.81%)	577 (34.35%)	660 (36.89%)	756 (36.81%)
Radiotherapy	496 (24.28%)	502 (29.88%)	508 (28.40%)	584 (28.43%)
Chemotherapy	148 (7.24%)	148 (8.81%)	122 (6.82%)	142 (6.91%)
Both (chemo+radio)	7 (0.34%)	12 (0.71%)	8 (0.45%)	5 (0.24%)
Not informed	640 (31.33%)	441 (26.25%)	491 (27.44%)	567 (27.61%)
Staging				
0	29 (1.42%)	28 (1.67%)	45 (2.52%)	34 (1.66%)
I	51 (2.50%)	37 (2.20%)	60 (3.35%)	51 (2.48%)
II	118 (5.78%)	104 (6.19%)	96 (5.37%)	112 (5.45%)
III	199 (9.74%)	207 (12.32%)	198 (11.07%)	235 (11.44%)
IV	254 (12.43%)	286 (17.02%)	239 (13.36%)	299 (14.56%)
Not applicable	752 (36.81%)	577 (34.35%)	660 (36.89%)	756 (36.81%)
Not informed	640 (31.33%)	441 (26.25%)	491 (27.44%)	567 (27.61%)
Time to treatment initiation				
<30 days	804 (39.35%)	635 (37.80%)	715 (39.97%)	813 (39.58%)
31-60 days	102 (4.99%)	144 (8.57%)	132 (7.38%)	137 (6.67%)
>60 days	497 (24.33%)	460 (27.38%)	451 (25.21%)	537 (26.14%)
Not informed	640 (31.33%)	441 (26.25%)	491(27.44%)	567 (27.61%)

Table 2. Descriptive analysis and Friedman test of Brazilian SGC, staging, and TT records from 2019 to 2022

Year	2019			2020			2021			2022			Adjusted
Variables	M_d	P25%	P75%	M_d	P25%	P75%	M_d	P25%	P75%	M_d	P25%	P75%	*p*-value*
Total SGC	42.00	7.00	103.00	31.00	12.00	89.00	35.00	10.00	92.00	39.00	12.00	115.00	0.119
Staging													
0	.00	.00	1.00	.00	.00	1.00	.00	.00	1.00	.00	.00	1.00	0.875
I	1.00	.00	4.00	1.00	.00	2.00	1.00	.00	3.00	1.00	.00	3.00	0.633
II	3.00	.00	7.00	2.00	1.00	6.00	1.00	.00	6.00	2.00	.00	7.00	0.733
III	4.00	1.00	14.00	3.00	1.00	13.00	4.00	1.00	9.00	4.00	2.00	16.00	0.244
IV	4.00	2.00	11.00	7.00	2.00	15.00	5.00	2.00	12.00	5.00	3.00	14.00	0.466
Not applicable	14.00	3.00	41.00	8.00	4.00	23.00	12.00	6.00	34.00	11.00	4.00	46.00	0.980
TT (days)													
<30	14.00	5.00	46.00	11.00	5.00	26.00	13.00	6.00	36.00	13.00	4.00	46.00	0.281
31-60	1.00	.00	5.00	1.00	.00	6.00	3.00	.00	9.00	2.00	.00	6.00	0.034
>60	10.00	2.00	29.00	9.00	4.00	26.00	11.00	3.00	26.00	9.00	4.00	29.00	0.384

Captions: M_d = median; P% = percentile ; * = Friedman test; TT = time-to-treat.

The Brazilian Southeast and Northeast regions also led the way regarding the total number of cases recorded, corroborating Brazilian oral cancer epidemiological studies[28,31]. The highest number of registrations in these regions is consistent with highest population of these two regions[31]. Furthermore, these regions have a great concentration of dental specialty centers (DSC), a SUS' secondary care services which offers stomatology services[32] that may favor better access of the local population to diagnoses of oral lesions. In the four years analyzed, SGC records were more prevalent in males from the fifth decade of life, consistent with the literature findings[3,4,30].

Surgery was the most common therapeutic modality, followed by radiotherapy. These results are aligned with the literature's, where surgical resection is the standard to treat salivary gland carcinomas[28]. Concomitantly, radiotherapy is the therapeutic option of choice in situations where surgery is not feasible or there is significant morbidity[25,30].

In all the years analyzed, it was observed that the number of surgery records corresponded to the number of cases classified as "not applicable". This fact can be attributed to the possibility that the patients had small tumors, which were entirely removed surgically during excisional biopsy procedures as the excisional biopsy process can be considered the treatment itself since confirmation of malignancy only occurs when the biopsy result is obtained. According to Rodriguez et al.[33], surgical removal of primary salivary gland malignancies is often curative, especially when the tumor is small and easily accessible.

For the cases where staging was applied, stages IV and III were the most prevalent for the years investigated. However, the literature does not offer a clear conclusion of which stage of SGC is more frequently found. Cheung et al.[34] observed in their sample that 50.1% of the cases were classified at stage III, while Mallik et al.[35] reported 55.3% at stage IV. On the other hand, Iwata et al.[30] indicated that 60% of their sample was classified at stages 0, I, or II. A Brazilian study conducted before the pandemic showed that most of the SGC cases were at stage IV[28].

Regarding the type of staging, an increase was observed in the median of cases registered at a more advanced stage of SGC (stage IV) during the initial wave of the pandemic. A Dutch study showed a rising trend of stage IV oral cancer registrations in 2020 against previous years[26], which may suggest that a reduction in screening actions may have led to a decline in the early identification of malignant lesions in this period[36].

On the other hand, the increase of the registration of less advanced cases during the second wave (stages 0 and 1) could be explained by the relief of the health system in the second half of 2021, which showed an improvement of the pandemic monitoring indicators, because of the expanded immunization process since the beginning of July 2021[18].

However, the increase of registrations of advanced cases of SGC (stages II and IV) in the last year of the health crisis can be explained by possible underdiagnosis and underreporting during the early stages of the pandemic,

contributing to a backlog of cases that were only diagnosed between 2021 and 2022. Delayed diagnoses can lead to a more advanced stage of the disease[37], which justifies the possibility that underreporting in 2020 and 2021 deteriorated the staging of cases in 2022. Thus, 2022 can be seen as a period when the repercussions of underreporting and underdiagnosis began to be confronted and managed. The guidance from the control bodies was for health services to take advantage of the period of lower transmission of COVID-19 to adjust their response to demands to meet those that had been held back during the previous stages of increasing COVID-19 cases[18].

Similarly, treatments started within 30 days declined, albeit not significant, during the initial wave, which can also be explained by the overload of the health system, especially concerning the availability of hospital beds and the need for a longer waiting time for admission[38]. Similarly, when analyzing oral cancer, Lo Giudice et al.[39] pointed to a slight decrease in the mean number of cases in 2020 against 2019, classifying this difference as small, so no increase in treatment delay was identified during the COVID-19 pandemic in Italy. Schoonbeek et al.[26] showed that the time to start cancer therapy in specialized centers was significantly shorter during the first COVID-19 year (2020) than the previous year. In the first half of 2020, the median of cases treated with less than 30 days increased, but without significant difference.

However, the results of this study showed that TT <30 days remained the most recorded over all the periods analyzed, followed by TT >60 days, similar to records from years before the pandemic[28]. Regarding the delayed treatment of patients with head and neck cancer, an interval of more than 60 days has been estimated to affect survival by 26%, resulting in an increased risk of death against less than 30 days[40]. Also, Su et al.[41] identified a significant 18% increase in mortality risk when the delay in treatment exceeded six weeks. Therefore, although most records in this study were within the ideal treatment timeframe, some did not meet law-mandated deadlines. Delaying the beginning of the treatment can supposedly result in the progression of the disease, the need for longer treatments, higher costs for the service, and lower survival time[42].

The increase of the median of treatments started more than 60 days after diagnosis from 2020 to 2021 may be related to the increase of advanced stages, which often require a more complex treatment approach. In these cases, high-risk patients may benefit from a preoperative assessment with radio-oncologists, dentists (to adjust the oral environment if postoperative radiotherapy is possible), reconstructive surgeons (in situations involving facial nerve sacrifice, large soft tissues, or compound defects), or neuro-otologic surgeons (if temporal bone resection is necessary)[43]. Therefore, the complexity of the case can contribute to an increase in the time until treatment begins.

Although no significant differences have been found in the quantity of SGC, staging, and TT records in the periods evaluated, it is not possible to ignore the median difference observed since SGC is a rare and potentially aggressive form of cancer depending on the histology, with high recurring rates[44]. Furthermore, any delay in the diagnosis or treatment of cancer substantially increases the risk of tumor progression, transforming conditions that were initially curable and did not have such a negative impact on the patient's quality of life into incurable cases, with a significantly reduced life expectancy[14].

On the other hand, these results suggest that the Brazilian public health system managed to maintain a consistency of cancer care, even during the COVID-19 pandemic. However, there are obstacles to be overcome by health services in the long term regarding the treatment, support, and rehabilitation modalities needed to meet the demands of patients diagnosed with SGC, especially in more advanced stages, during the pandemic period[45]. Some nuances deserve attention since Brazil was already facing challenges before the pandemic in organizing screening, access to diagnostic procedures, and the long waiting periods until the start of cancer treatment[46]. It is therefore necessary to re-evaluate and plan strategies to improve early detection of SGC in Brazil and seek measures to ensure speedy diagnosis and treatment of confirmed cases.

This study has the limitation of working only with major SGC, since obtaining data on minor SGC in Brazilian cancer information systems[28] is impossible. Another important limitation is the use of secondary data, where inadequate completion of data by the professionals who feed the system or registration after the deadline set by the Ministry of Health can lead to bias. Furthermore, the study design does not allow causality to be inferred. Given the relatively uncommon nature of SGC and limited available information, this study is relevant because it analyzed SGC records and considers an atypical period of operation of health services due to the COVID-19 pandemic. Post-pandemic studies are recommended.

CONCLUSION

The analysis of SGC registrations, staging, and time to treatment initiation showed variations between the pre-and trans-pandemic years, but with no statistically significant differences among the periods analyzed. These

results suggest that the Brazilian public health system managed to maintain a consistency of cancer care, even during the COVID-19 pandemic.

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CONTRIBUTIONS

Vitória Ferreira Leite, Débora Rosana Alves Braga Silva Montagnoli, Maria Cássia Ferreira Aguiar, Mauro Henrique Nogueira Guimarães Abreu, and Renata Castro Martins contributed substantially to the study design; Vitória Ferreira Leite, Débora Rosana Alves Braga Silva Montagnoli, Yasmim Silva Godoy, and Renata Castro Martins contributed to the acquisition, analysis and interpretation of the data; Vitória Ferreira Leite contributed to the writing of the manuscript; Alex Júnio Silva Cruz, Maria Cássia Ferreira Aguiar, Mauro Henrique Nogueira Guimarães Abreu, and Renata Castro Martins contributed to the critical review. All authors approved the final version for publication.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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