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IMPACT OF THE COVID-19 PANDEMIC ON A HISTOPATHOLOGY SERVICE IN A MUNICIPALITY OF NORTHEAST BRAZIL

IMPACTO DA PANDEMIA DE COVID-19 EM UM SERVIÇO DE HISTOPATOLOGIA DE UM MUNICÍPIO DO NORDESTE DO BRASIL

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Ariadne Gomes Farias
Universidade Federal Rural do Semi-árido.
http://orcid.org/0000-0002-9283-2087

Larissa Bruna Ribeiro Xavier
Universidade Federal do Rio Grande do Norte (UFRN).
http://orcid.org/0009-0001-7458-4825

Pedro Paulo do Nascimento Barbosa
Universidade Federal do Rio Grande do Norte (UFRN).
http://orcid.org/0009-0002-2287-4297

Cláudia Nunes de Oliveira
Professora do Departamento de Patologia. Universidade Federal do Rio Grande do Norte (UFRN). http://orcid.org/0000-0002-2853-320X

Sidnei Miyoshi Sakamoto
Professor do Departamento de Ciências da Saúde. Universidade Federal Rural do Semi-árido (UFERSA).
http://orcid.org/0000-0003-4116-0388

***Maiara de Moraes**
Professora do Departamento de Patologia. Universidade Federal do Rio Grande do Norte (UFRN). E-mail: maiara.moraes@ufrn.br
http://orcid.org/0000-0002-0602-4594

***Autor correspondente:** Departamento de Patologia. Centro de Ciências da Saúde. Universidade Federal do Rio Grande do Norte - UFRN, Natal, Rio Grande do Norte, Brasil.
Moraes M - ORCID: https://orcid.org/0000-0002-0602-4594; E-mail: maiara.moraes@ufrn.br; URL Lattes: http://lattes.cnpq.br/0669925240476088

ABSTRACT

Introduction: *The COVID-19 pandemic significantly impacted essential diagnostic services like pathology. This study aims to evaluate the impact of the pandemic on the utilization of pathology services, specifically biopsies, during the initial restrictions of this period.* ***Methodology:*** *Data from histopathological reports during a period considered as a baseline, pre-lockdown, and lockdown in 2019 were collected and analyzed, comparing them to those in 2020.* ***Results:*** *The total number of biopsies performed during the pandemic period was reduced, directly reflecting the decrease in access to medical services and the rescheduling of non-emergency procedures. There was a significant increase in the waiting time for specimens and the turnaround time for reports in the laboratory during the lockdown. An important shift occurred in the profile of pathological diagnoses during the analyzed periods. The biopsies included tissues from various anatomical systems, such as gastrointestinal, male and female reproductive, skin, musculoskeletal, and respiratory systems. There was an overall reduction in the diagnosis of malignant neoplasms in most anatomical sites, except for the skin, where an increase in cancer diagnoses was detected.* ***Conclusions:*** *The number of biopsies performed decreased significantly during the pandemic, reflecting the impact of health restrictions on access to medical services. The reduction accompanied a significant change in the profile of pathological diagnoses and the location of lesions. Changes observed in the pattern of malignant neoplasm diagnoses reflect the importance of the functioning of this service for early diagnosis, as well as the need to anticipate future changes in the dynamics of laboratory flow that may impact patients and pathologists in future crisis moments.*

KEYWORDS: *COVID-19, Workload, Pathology diagnostics, Malignancy rate.*

RESUMO

Introdução: A pandemia de COVID-19 trouxe um impacto significativo em serviços diagnósticos essenciais, como a patologia. Este estudo tem como objetivo avaliar o impacto da pandemia na utilização dos serviços de patologia, especificamente as biópsias, durante as restrições iniciais desse período. **Metodologia:** Dados dos laudos histopatológicos durante um período considerado como linha de base, período pré-bloqueio e bloqueio em 2019 comparados aos mesmos períodos em 2020 foram coletados e analisados. **Resultados:** O número total de biópsias realizadas durante o período pandêmico foi reduzido, refletindo diretamente a diminuição do acesso aos serviços médicos e a reprogramação de procedimentos não emergenciais. Aumento significativo do tempo de espera do material e do tempo de entrega dos laudos no laboratório durante o bloqueio. Houve significativa mudança no perfil do diagnóstico patológico durante os períodos analisados. As biópsias incluíram tecidos provenientes de diversos sistemas anatômicos, como gastrointestinal, reprodutor masculino e feminino, pele, músculo-esquelético e respiratório. Houve redução global no diagnóstico de neoplasias malignas na maioria dos sítios anatômicos, à exceção da pele onde detectou-se um aumento no diagnóstico de cânceres. **Conclusões**: O estudo evidenciou uma redução significativa na quantidade de biópsias realizadas durante o período pandêmico, refletindo o impacto das restrições sanitárias no acesso aos serviços médicos. Essa redução foi acompanhada por uma significativa mudança no perfil do diagnóstico patológico e localização das lesões. Mudanças evidenciadas no padrão do diagnóstico de neoplasias malignas refletem a importância do funcionamento desse serviço para o diagnóstico precoce, além de apontar a necessidade de prever futuras alterações na dinâmica do fluxo laboratorial que podem impactar os pacientes e patologistas em futuros momentos de crise.

PALAVRAS-CHAVE: COVID-19, Carga de trabalho, Diagnóstico patológico, Taxa de malignidade

INTRODUCTION

In March 2020, the World Health Organization declared a COVID-19 pandemic, emphasizing the urgency of coordinated global actions to contain the spread of the virus.[1] Non-pharmacological measures, such as lockdowns, isolation, and physical distancing, significantly impacted access to healthcare services due to reduced medical care and the postponement of procedures such as screening exams, biopsies, and surgeries. This resulted in changes to diagnostic triage due to restrictions affecting in-person care, as well as significant reductions in the use of healthcare services, with an average decrease of 31.4% in the diagnostic services category, including pathology services, imaging, and screening investigations, covering a wide range of services from cardiovascular diseases to emergency services, immunization, orthopedics and trauma, gastroenterology, and mental health.[2]

Elective procedures were canceled or postponed, particularly in the first weeks of disruption worldwide, leading to a decrease in exams performed and delays in diagnoses.[3–6] A study evaluated data from the National Health Service during this period, estimating an increase in morbidity and mortality among patients scheduled for breast, cervical, and colorectal cancer screenings.[7] In this context, several studies were conducted to demonstrate changes in the routine of pathology laboratory services, reducing the number of biopsies and other screening exams,[5,8–13] as well as delays and diagnoses of some types of cancers and tumors at more advanced stages.[3,14–16]

Monitoring the modifications in Anatomic Pathology services will enable the development of strategies to minimize the effects of service interruptions and position the role of this service in hospital care for workforce adaptation and reorganization. This study aimed to evaluate the impact of the first weeks of COVID-19 restrictions on biopsy services to understand the losses and the changes the pandemic caused in pathology services and the diagnostic routine.

METHODOLOGY

Study Design and Data Source

The study was approved by the ethics committee (No. 5.323.946). This is a cross-sectional, observational study based on secondary data obtained from histopathological

reports of the Anatomic Pathology Unit (APU) and conducted in the pathology department. It is worth noting that APU serves the demands of two university hospitals and the State Maternity School. Data on the number of histological samples during 11 weeks in 2019 and 2020 were obtained from the laboratory information management system, using the date of entry into the service for case selection.

Inclusion Criteria

We selected weeks 5 to 8 (January 27 - February 23, 2020) as the reference/baseline period, weeks 9 to 11 (February 24 - March 15, 2020) as the pre-lockdown period, and weeks 12 to 15 in 2020 (March 16 - April 12, 2020) as the lockdown period, since Brazil declared a state of emergency due to the COVID-19 pandemic in week 12 (March 18, 2020) and recommended that the population stay at home, imposing restrictions on movement and social gatherings. Histopathological reports from the same 11-week period in 2019 (i.e., January 28 to April 14, 2019) were examined for comparison. Clinical records and histopathological reports with insufficient information were excluded from the study.

Data Collection

To facilitate data collection, a questionnaire was created in the software Epi Info 7.2.5.0 to extract personal data from each patient's file, such as sex, date of birth, and age, as well as the type of examination performed (anatomical pathology/biopsy), sample collection date, date of entry into the laboratory, and date of the medical report. To identify the origin of the demands, cases were divided into categories according to the classification of the human system/ specific anatomical sites such as the immune system; gastrointestinal system; respiratory system; musculoskeletal system; urinary system; male reproductive system; female reproductive system; nervous system; skin; thyroid; parathyroid; and unspecified.

Pathological Processes and Data Tabulation

Two pathologists (MM and CNO) were responsible for categorizing the main general pathological processes/diagnoses into 11 categories: cysts; within histological limits of normality; hemorrhagic circulatory disorders; inadequate for diagnosis; lesions with potential for malignancy; benign neoplasm; malignant neoplasm; adaptive processes; degenerative processes; infectious inflammatory processes; non-infectious inflammatory processes; and

others not classified in the remaining categories. The collected data were tabulated in Microsoft Excel® (Seattle, WA, United States) and analyzed using free-access statistical software.

Data Analysis

Variables and Periods Analyzed

To evaluate changes in the number of biopsy exams performed in the service, the average number of biopsies, the average time in days for report delivery, and the waiting time for material in the 11 weeks calculated for 2019 (pre-pandemic) and 2020 (pandemic) were compared across the periods (Reference/Baseline, Pre-lockdown, Lockdown, and Pre-pandemic). The average weekly number of biopsies during the epidemiological weeks was compared. The general pathological processes identified and the origin of demands (anatomical sites of biopsies) were compared between the pandemic and pre-pandemic periods.

Statistical Tests Used

The t-test was used to compare means in independent groups, ANOVA was used to assess differences between three or more groups, and the chi-square test with odds ratio calculation was employed to analyze associations between categorical variables. Before conducting parametric tests, data normality was verified by the Shapiro-Wilk test, and variance homogeneity was evaluated using Levene's test. For the chi-square test, the minimum expected frequency condition was ensured. All analyses maintained a significance level of 0.05, preserving scientific rigor and formality. In cases of significant differences identified by ANOVA, post-hoc tests such as Tukey’s or Bonferroni tests were performed to determine groups with statistically significant differences, enhancing the analytical approach of the results. Analyses were performed using freely distributed programs like EpiInfo and Jamovi.

RESULTS

Out of 7738 histopathology cases, 7207 biopsy cases were analyzed. The majority of these were women (4530, 62.84%). The average age was 50.76 years with a standard deviation of ±19.45. When comparing the average number of biopsies during the 11-week

pandemic period (2880/39.96%) with the same period in 2019 (4327/60.04%), a statistically significant reduction (p<.001) was observed in the pandemic year. Of the total cases analyzed, 2160 (29.96%) originated from the gastrointestinal system and 2007 (27.85%) from the female reproductive system (other anatomical sites are described in Table 1).

Table 1 Distribution of biopsies by anatomic sites: comparison between 11 weeks in 2019 and 2020. APU, Natal/RN, 2024.

ANATOMICAL SITES	2020	2019	TOTAL
Gastrointestinal System	1095	1064	**2160**
Musculoskeletal System	26	318	**344**
Eye	17	6	**23**
Parathyroid	22	22	**44**
Skin	211	169	**380**
Female Reproductive System	752	1255	**2007**
Male Reproductive System	436	259	**695**
Respiratory System	55	98	**153**
Cardiovascular System	3	14	**17**
Immune System	56	75	**131**
Nervous System	17	30	**47**
Thyroid System	37	68	**105**
Urinary System	75	119	**194**
Unspecified anatomical site	78	830	**908**
TOTAL	**2880**	**4327**	**7207**

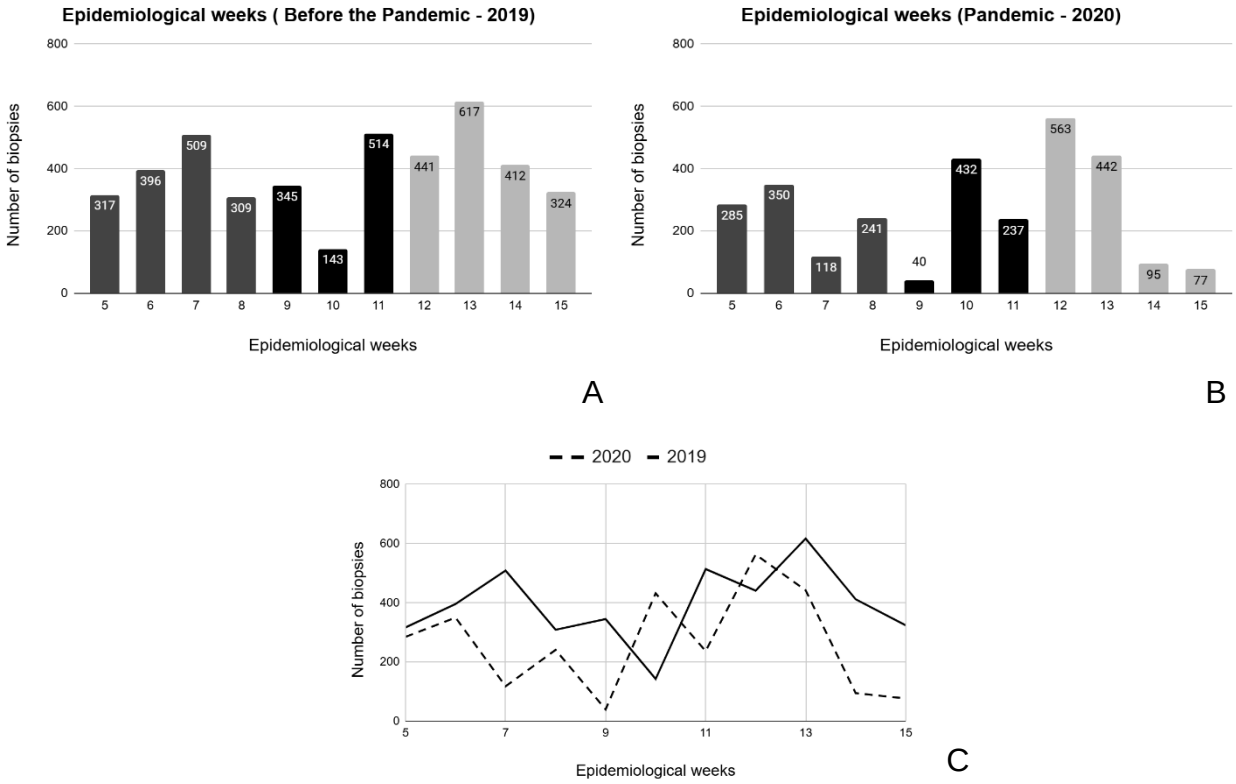
Source: Own elaboration.

When comparing the absolute and relative distribution of anatomical sites in the periods of 2019 and 2020, a reduction was observed in the number of biopsies from the musculoskeletal system (318/92.44% and 26/7.56%, respectively in 2019 and 2020) and the female reproductive system (1255/62.53% and 752/37.47%, respectively in 2019 and 2020), in addition to an increase in biopsies from the skin (169/44.47% and 211/55.53%, respectively in 2019 and 2020) and from the male reproductive system (259/35.27% and 436/62.73%, respectively in 2019 and 2020).

Number of biopsies in epidemiological weeks

The number of exams performed during the epidemiological weeks can be seen in Figure 1.

Figure 1 Proportion of Biopsies by Epidemiological Weeks (Pre-Pandemic vs. Pandemic). APU, Natal/RN. 2024.



Legend: Epidemiological weeks 5 to 15 in the year before the pandemic (1A) and during the pandemic (1B). Each bar on the graph corresponds to an epidemiological week (weeks 5 to 8 = reference/baseline period; weeks 9 to 11 = pre-lockdown period; weeks 12 to 15 = lockdown period). Epidemiological week 12, when the lockdown began in Brazil. Epidemiological weeks 5 to 15 in the year before the pandemic are represented by a solid black line, while those during the pandemic are shown with a dashed black line (1C). Self-generated periods at APU, Natal/RN. 2024.

It is observed that there were reductions in the number of biopsies during the Carnival periods (a national holiday in Brazil, on March 4, 2019, and February 24, 2020, corresponding to weeks 10 and 9, respectively) and on March 9, 2020 (week 11), just days before the pandemic was declared by the World Health Organization (WHO). When comparing epidemiological week 12 (1B) (corresponding to the period of the beginning of the lockdown in Brazil on March 16, 2020) with the same week in the year before the pandemic (March 18, 2019) (1A), there was an increase in the number of biopsies after the start of the lockdown (1B), a significant reduction is seen in the following epidemiological weeks (13 to 15).

Entry Time, Delivery Time, and Waiting Time in the Service

The average time required for the collected sample to reach the Laboratory Unit was 11.81 days during and 7.68 days before the pandemic (Table 2). The average time in days for the delivery of the biopsy report during the pandemic was 31.78, compared to 46.06

before the pandemic. When comparing the pre-pandemic period with the pandemic, there was a statistically significant increase in the time it took for the material to arrive at the service ($p < 0.001$) and a statistically significant reduction in the report delivery time ($p < 0.001$). In other words, during the pandemic, the material took longer to be received and processed in the laboratory's routine, but the examination was completed faster, resulting in the delivery of the biopsy report in less time.

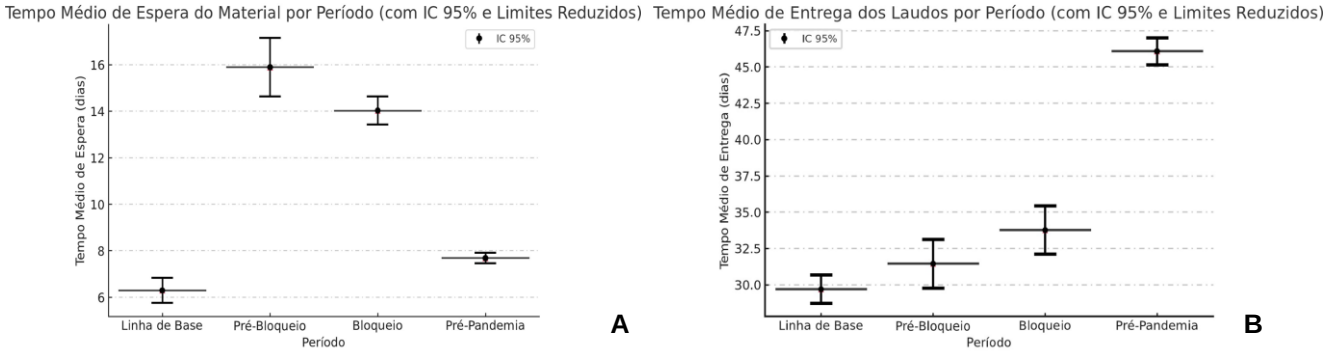
Table 2. Waiting time and delivery of the report in days in the 11 weeks analyzed in the pre-pandemic (2019) and pandemic (2020). APU, Natal/RN. 2024.

		n	Mean	Median	p-value
Report delivery time	Pre-pandemic (2019)	2880	46.06	45	<.001
	Pandemic (2020)	4327	31.78	27	
Material waiting time	Pre-pandemic (2019)	2879	7.68	6	<.001
	Pandemic (2020)	4326	11.81	11	

Source: Own elaboration. ANOVA. Tukey's Post-Hoc Test. Significance level: ⍙=0.05

The average waiting time in days for receiving the material and delivering the report during the analyzed periods is shown in Figure 2. During the pandemic, there was an increase in the waiting time for the material during the pre-lockdown and lockdown periods compared to the baseline ($p < 0.001$, respectively). When comparing the pre-lockdown period with the lockdown period, there was a reduction in the waiting time for materials during the lockdown ($p < 0.001$). Furthermore, there was an increase in the report delivery time during the lockdown compared to the baseline ($p = 0.005$).

Figure 2. Average Waiting Time in Days for Material and Report Delivery in the Analyzed Periods. APU, Natal/RN. 2024.



Source: ANOVA. Legend: (2A) Material waiting time; (2B) Report delivery time. Baseline/Reference period - weeks 5 to 8; Pre-blockade period - weeks 9 to 11, Blockade period - weeks 12 to 15/, Pre-pandemic (control) period - weeks 5 to 15.

General Pathological Processes Identified

The absolute distribution of the general pathological processes identified in 2019 and 2020 is shown in Table 3. When comparing these years, it is observed that there was a statistically significant reduction in the diagnosis of ‘lesions with potential for malignancy’ (odds ratio = 0.69, p < 0.0026), ‘adaptive processes’ (odds ratio = 0.84, p < 0.0015), and ‘hemorrhagic circulatory disorders’ (odds ratio = 0.54, p < 0.0003).

Table 3. Absolute and Relative Distribution of General Pathological Processes Diagnosed in Biopsy Specimens During the Pandemic (2020) and Pre-Pandemic (2019) Periods. APU, Natal/RN. 2024.

General pathological processes	2020	2019	Total	Odds ratio (IC 95%)	p-value
Within normal histological limits	732	1172	1904	1	0.12
Cysts	183	291	474	1.24 (0.94 – 1.63)	0.12
Hemorrhagic circulatory disorders	49	145	194	0.54 (0.39 - 0.76)	0.0003*
Unsuitable for diagnosis	25	6	31	6.67 (2.72 – 1.34)	0.00002*
Lesions with malignant potential	112	259	371	0.69 (0.54 – 0.888)	0.0026*
Benign neoplasm	267	285	552	1.5 (1.24 – 1.81)	0.00003*
Malignant neoplasm	270	309	579	1.4 (1.1 – 1.9)	0.00044*
Adaptive processes	586	1111	1697	0.84 (0.74 – 0.97)	0.015*
Degenerative processes	47	81	128	0.92 (0.64 – 1.35)	0.69
Infectious inflammatory processes	213	381	594	0.89 (0.74 – 1.08)	0.26
Non-infectious inflammatory processes	784	1105	1889	1.14 (0.99 - 1.29)	55
Others not classified in the above categories	60	231	291	0.42 (0.31 – 0.56)	<0.00000001*

Source: Self-generated. Significance Level: α = 0.05

Trends in Malignant Neoplasia Biopsies

The diagnosis of 'malignant neoplasm' in 2020 (n=270; 46.63%) was lower compared to the same period in 2019 (n=309; 53.37%) (p<.001). When analyzing the relative distribution, in 2020, 9.38% (270/2880) of cases were diagnosed as 'malignant neoplasms,' and in 2019, it was 7.34% (309/4327) (odds ratio=1.34; p<.000). That is, there was a 34% increase in the identification of malignant neoplasms during the year of the pandemic.

The main anatomical sites associated with the diagnosis of 'malignant neoplasm' are described in Table 4. The skin (odds ratio=1.97; p<0.008) stands out as an anatomical site

where cases of 'malignant neoplasms' increased, while the female reproductive system (odds ratio=0.38; p<0.000) showed a decrease in cases of 'malignant neoplasms' during the year of the pandemic.

Table 4. Absolute and Relative Distribution of Specimens Diagnosed with Malignant Neoplasms by Anatomical Site During the Pandemic and Before the Pandemic. APU, Natal/RN. 2024.

	2020			2019				
Malignant neoplasms by AS	**Yes**	**No**	**TOTAL**	**Yes**	**No**	**TOTAL**	***Odds ratio* (IC 95%)**	**p-value**
Gastrointestinal System	42	1053	1095	50	1015	1065	0.81 (0.53 - 1.23)	323
Musculoskeletal system	1	25	26	27	291	318	0.43 (0.06 - 3.31)	0.41
Eye	3	14	17	1	5	6	1.07 (0.09 - 12.83)	0.96
Parathyroid	0	22	22	3	19	22	0	0.14
Skin	63*	148	211	30	139	169	1.97 (1.21 - 3.23)	0.006*
Female Reproductive System	26*	726	752	108	1148	1256	0.38 (0.25 - 0.59)	<0.001*
Male Reproductive System	82	354	436	42	217	259	1.19 (0.79 - 1.80)	0.39
Respiratory System	8	47	55	6	92	98	2.61 (0.86 - 7.96)	0.08
Cardiovascular System	0	3	3	0	14	14	0	0.66
Immune System	8	48	56	9	66	75	1.22 (0.44 - 3.39)	0.7
Nervous System	12	5	17	7	23	30	7.89 (2.06 - 30.21)	2
Thyroid	1	36	37	1	67	68	1.89 (0.11 - 31.09)	0.2
Urinary System	18	57	75	13	106	119	2.57 (1.17 - 5.63)	15
Unspecified anatomical site	6	72	78	12	818	830	5.68 (2.07 - 15.58)	<0.001*
TOTAL	270	2610	2880	309	4020	4329	1.34 (1.13 - 1.59)	<0.001

Source: Self-generated. Significance Level: α = 0.05

Distribution of Malignant Neoplasms by Gender

Before the pandemic, male patients had a 2.25 times higher chance of receiving a positive diagnosis for malignant neoplasm compared to female patients. In the year of the pandemic, maintaining the same 11-week interval for analysis, this ratio was reduced to 1.95. An increase was observed in the incidence of positive diagnoses for malignant neoplasm, with rates in males rising from 10.70% to 13.12%, and in females from 5.04% to 7.19%, respectively, in 2019 and 2020 (Table 5).

Table 5. Distribution of specimens diagnosed with malignant neoplasia by sex in the period before the pandemic (2019) and during the pandemic (2020). APU, Natal/RN. 2024.

Malignant Neoplasms	2020			2019				
Sex	**Yes**	**No**	**TOTAL**	**Yes**	**No**	**TOTAL**	**Odds ratio (95% IC)**	**p-value**
Male	140	927	1067	172	1435	1607	1.26 (0.99 - 1.59)	0.056
Female	130	1679	1809	137	2583	2720	1.46 (1.13 - 1.87)	0.03*
Total	270	2606	2876	309	4018	4327		

Source: Own elaboration. Significance level: ⍺=0.05. *p<.0001

DISCUSSION

It is not surprising that during the pandemic period, there was a reduction in the number of exams, as the measures to combat the pandemic hindered people's mobility, and indeed, there were significant changes in the routine of care and services. Supporting the findings of Yılmaz[11] and Kaufman et al.[17], women had the highest number of exams during the periods analyzed. The reduction in the number of exams conducted during the pandemic compared to the pre-pandemic period corroborates the results obtained in other locations.[5,9–11,13,18] Altindağ[10] reported a significant decline (above 70%) in the reception of histopathological samples compared to the pre-pandemic period, particularly in March, April, and May of 2020. Some authors report a significant decrease in the workload of services, especially in the periods following the lockdown, when the number of samples received in laboratories experienced a sharp decline, falling well below expected levels, similar to what was observed in our study.[5,11,18] We believe that these changes may have impacted the workflow in laboratories, as in our service, the time for report delivery was reduced during the pre-lockdown and lockdown periods, which could be associated with the reduced workload reported by the authors. The significant increase in the number of biopsies in the period immediately following the lockdown in the year of the pandemic (observed when comparing the epidemiological weeks, particularly in week 12) may be associated with an initial backlog, due to the performance of elective procedures that had already been scheduled, as well as the submission of all biopsied material that had been held up in hospital units.

Few studies have analyzed the average time in days for the collected sample to be received in the laboratory, and also the average time in days for the final report delivery by the service. This is concerning, as delayed diagnosis leads to a delay in treatment and

affects the patient's prognosis, as pointed out by Trasarti and colleagues.[3] Despite the reduction in the result release time during the pandemic, for tests that required complementary examinations for diagnosis (specifically, immunohistochemistry), there was an increase in the report delivery time. It is important to note that the speed of report delivery favors the treatment and prognosis of the patient. In this regard, we consider a significant flaw in our service, the delay in the delivery of the result for this complementary report.

It is also important to consider the individual differences related to the pathologists in the unit, as there are professionals dedicated exclusively to providing clinical services and teaching professionals who, due to the nature of their positions, engage in teaching, research, and extension activities. This difference can impact the time of report delivery among peers. Furthermore, it is important to highlight the individual differences of each pathologist related to the time for diagnosis and report issuance, in addition to the diagnostic challenges inherent in each case examined. Changes in laboratory management should also be considered, as they can impact the workflow of the service in the unit. Araújo and colleagues[19] point out that digital pathology and remote reports could be strategies that might mitigate workflow disruptions in pathology during future crises.

During the pandemic, in addition to the reduced demand for pathology services, there were also changes in the diversity of diagnosed cases. In contrast to our results, Vázquez Rosas and colleagues[9], Altindağ[10], and Van Velthuysen and colleagues[5] reported a statistically significant decrease in the skin biopsies. In addition to skin biopsies, Van Velthuysen and colleagues[5] noted a reduction during the lockdown period in specimens from the gallbladder, head and neck, soft tissues, and the upper and lower gastrointestinal tract. Supporting the findings of Altindağ[10] regarding greater reductions in gynecological biopsies, our study also demonstrated a decrease in the number of biopsies originating from the female reproductive system (1255/62.53% and 752/37.47%, respectively, in 2019 and 2020). The findings of Yıldırım and colleagues[13] regarding the reduction in the number of benign specimens from soft tissues and bone are in agreement with the results for the musculoskeletal system in our study. We believe these reductions may be associated with the cancellation of elective knee surgery procedures (such as arthroscopies) and, in the case of specimens from the female genital tract, the postponement of elective procedures in maternity hospitals, including cytopathology, which some studies[4–6] suggest is linked to the decline in biopsies due to the delay of cancer screening and diagnostic procedures. Both

sectors (surgery and gynecology) contribute significantly to the spontaneous demand in our laboratory unit.

Regarding the changes in the diagnostic profile in the laboratory, an important discussion highlights the reduction in cancer screening programs, particularly those associated with the female reproductive system (breast, cervix, etc.). Van Velthuysen and colleagues[5] documented a proportionally greater decrease in the number of benign diagnoses compared to malignant ones for most tissues, similar to what we observed, as despite the reduction in service demand, as evidenced in previous results, the chance of being diagnosed with cancer increased. An exception was breast cytology, which recorded a decrease in malignant diagnoses across all periods.

The overall reduction in cancer diagnoses, coupled with an increase in the frequency of diagnoses of tumors in more advanced stages, was a finding widely documented by other authors.[3,16] The main hypotheses raised to explain the numerical decrease in diagnosed cases include interruptions in screening programs, reduction in preventive measures, postponement of health exams, and limitations in access to healthcare services.

Supporting the findings of studies[14,20] that investigated the effect of the pandemic on cervical cancer screening and observed a decrease during the pandemic period compared to the pre-pandemic period, we believe our study also suggests this reduction, as maternity services, especially non-urgent and screening services, such as the Pap smear exam, were suspended.

Among the types of cancer analyzed in the study by Reinwald & Justenhove[16], the delay in the diagnosis of pancreatic tumors (53.4%) and prostate cancer (49.0%) was the most affected by the COVID-19 pandemic in 2020. De Vincentiis and colleagues[15] found similar effects for prostate, bladder, and colorectal cancers. Trasarti and colleagues[3] highlight an increase in the incidence of metastatic cancer from 2019 to 2021, with a notable rise in cases diagnosed during the pandemic period. Yildirim and colleagues[13] pointed to an increase in the number of malignant specimens from soft tissues and bone during the pandemic. Van Velthuysen and colleagues[5] observed a statistically significant reduction in malignant diagnoses, particularly in the periods following the first lockdown, for breast cancer, lower gastrointestinal tract, female genital tract, and prostate. However, they also found a period where there was an increase in the number of malignant specimens from the skin. Although our study did not differentiate tumor subtypes, an increase in malignant

neoplasms of the skin and a decrease in malignant resections from the female reproductive system were observed, corroborating the findings of some of the authors mentioned above.

A limitation of our study is that the sample was restricted to biopsy reports, in addition to being a retrospective study. Furthermore, it is important to emphasize that our pathology diagnostic service is not a reference center for cancer in the state, which directly affects the sample size of the neoplasms analyzed here, as well as the lack of comparison based on tumor subtypes. In this sense, it is believed that to assess the long-term impact of a possible increase in mortality from neoplasms, particularly malignant ones, a more in-depth analysis is needed at reference centers with larger datasets for a comprehensive understanding of the pandemic's consequences.

CONCLUSIONS

The COVID-19 pandemic led to a significant reduction in the performance of histopathological diagnostic services globally, as well as changes in the type of specimens received and the diagnostic profile, corroborating the findings of our study. The analysis of these data allowed for the identification of the origins of the demands and contributed to understanding the changes in the volume of specimens received by our service, in addition to identifying an increase in the waiting time for material processing in the laboratory unit.

Moreover, this study will help predict the impact of the pandemic on the workload of pathologists and the turnaround time for reports. From this perspective, the study can provide valuable information to laboratory unit managers, hospitals, and educational institutions by highlighting critical areas in need of improvement, particularly in teaching and services provided to the population.

During periods of restriction, it is important to emphasize the need to optimize diagnostic processes to ensure that the early detection of serious conditions is not compromised. Improving laboratory dynamics and public health policies that ensure continued access to medical services are suggested.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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