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Research Article

Pediatric Cancer Surgery during Covid-19 Period in Brazil

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Abstract

Introduction: In december 2019, the first case of Corona vírus infections causing na acute respiratory failure syndrome was reported in China. After 2 months, the world health Organization statement a COVID-19 Pandemic period., Childhood cancer stands out as the most importante cause of death, with aprproximately 8460/1 million new cases. COVID 19 was a challenging condition for Society and health systems in South america. New priority ordres of attendence and surgical routine were stablished to ensure health care by National Health Surveillance Agency (ANVISA). The high transmissibility and unknown pathophysiology, without specific therapy or vaccine, including Pediatric profile, characterizing and urgency of global confrontation.

Objective: Demonstrate our COVID-19 strategies and how they influenced the surgical treatment of Pediatric câncer patients.

Methods: This are a retrospective cohort study from march 2020 to February 2022 in oncohematology patients, aged between 0 and 16 years old, submitted to surgical procedures. They were stratified by age, sex, pathology, symptoms, COVID-19 laboratorial tests, type of surgical procedure and retard. Statistical analysis was performed (P-value).

Results: 390 patients were aged up, the incidence of death considered 10.5%, 7.0% of tested were positive for covid 19 and 2.1% of cases were treated at home. The delay surgical procedure occurred in 2.8% of cases. There was and 18% reduction in the total number of global surgical procedures. Conclusions: Coronavirus infection still a challenge, more studies experience are necessary to get new perspectives in treatment and follow up of Pediatric Oncology group.

Keywords: COVID-19, Cancer, Protocol, Pediatric, Surgery

INTRODUCTION

Childhood cancer is the second leading cause of death among children in Brazil [1,2]. In most cases of cancer, early diagnosis and the lack of effective therapeutic interventions lead to better survival rates [3,4].

In its initial phase, the novel coronavirus disease 2019 (COVID-19) presented a unique challenge for society and health care systems because of the high transmissibility and unknown pathophysiology of the SARS-CoV-2 virus and the lack of specific treatments and vaccine options, highlighting the need for of a global response. The lack of knowledge regarding its presentation in the pediatric oncology population represent a new challenge for the World Health Organization (WHO), whose goal is to achieve 60% survival for all children with cancer by 2030 [5].

The first case of SARS-CoV-2 infection causing severe acute respiratory syndrome in Brazil was confirmed in February 2020 [6]. We were then faced with a new reality that would change the routine of many cancer centers, both in terms of the form and time of diagnosis and the continuity of treatment [7]. presentations in immunosuppressed pediatric patients, sudden social isolation, lack of awareness of early signs and symptoms, difficulty in accessing health care institutions, and fear of contracting the virus in a community or hospital setting have the potential to cause diagnostic and treatment delays [8]. Many cancer centers have changed to deal with the pandemic [9]. This study aimed to describe the results of COVID-19 coping strategies adopted in a pediatric oncology center in Brazil.

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MATERIALS AND METHODS

Setting and study design

This was a retrospective cohort study of pediatric hematology/oncology patients aged 0 - 16 years who underwent surgery and received home care or were treated at the Brazilian National Cancer Institute (INCA) in Rio de Janeiro from March 2020 to February 2022, **(Table 1)**

- The criteria for **SARS-CoV-2** testing at INCA are described below:Patients referred for major surgery were tested for

Tested patients(n=214)		COVID NEGATIVE			COVID POSITIVE			global test statist analysis #	
		DELAY			DELAY			p-value	X2
		no	< 15d	> 15d	no	< 15days	> 15days		
Sex								0,735	
Female	109	100			4	3	1		0,115
Male	105	97			3	1	3		
Age								0,007	
under 1 year	41	39			1	1			12,18
2 a 5 y	73	65			4		2		
6 a 11 y	50	48				1	1		
12 a 16 y	50	45			2	2	1		
Symptons								1,000*	
yes	204	197			2	2	1		0,003
no	10				5	2	3		
Clinic								0,077	
Hematology	47	43			3		1		3,127
Pediatrics	167	154			4	4	3		
Treatment								1,000*	
at Home	8				3	4	1		0,01
Hospital	7				4	0	3		

Table 1 Oncology patients aged 16 years and younger tested between March 2020 and February 2022 at the National Cancer Center Institute. This table also represents the follow-up survival test analysis of patients in this study (test and no test (n=319).
note:n=number; d=days; y=years; *Fisher test; # tested and no tested patients statistical global analysis (n=390).

SARS-CoV-2 using quantitative RT-PCR at the time of admission.

- Patients referred for outpatient or minor inpatient surgery were not tested for **SARS-CoV-2**, except for those with respiratory symptoms or close contacts with clinical symptoms.
- Patients not tested who underwent surgery recovered from anesthesia in an isolation room.

The following actions were taken in relation to pediatric oncology patients who tested positive for SARS-CoV-2:

- In asymptomatic patients or patients with mild symptoms, social distancing, use of symptomatic medications, clinical reassessment after one week and an additional SARS-CoV-2 test were indicated; in case of a negative test result, the surgical procedure was provided. In case of a positive test result, medical advice was given according to the clinical manifestation.
- Patients with moderate or severe COVID-19 symptoms were hospitalized until test results were available.

Statistical analysis

Data were collected from physical or electronic medical records and added to an Excel spreadsheet. Statistical analyses were conducted using statistical software. A significance level of $p < 0.05$ was used for all statistical tests. **(Table 2).**

RESULTS

A total of 390 INCA oncology patients aged 16 years and underwent surgical procedures between March 2020 and February 2022. The typical age group was 2–5 years (32.6%), and there was no significant difference in the proportion of male and female patients (p=0.649). Pediatric oncology cases accounted for 79.8% of cases (p<0.001) and only 2.6% of oncology patients had COVID-19 symptoms. In addition, 54.9% of the patients who underwent surgical procedures were tested for SARS-CoV-2, of whom 92% tested negative for SARS-Cov-2 infection, 7% tested positive, and 1% returned an indeterminate test result. Of those who tested positive, 53.3% received home care and 46.7% remained in the hospital for treatment. Additionally, 72.3% of patients had a catheter for cancer treatment in (p<0.001). Eleven patients (2.8%) were scheduled and delayed for surgery and seven patients with a delayed procedure (63.6%) experienced a delay of < 15 days. The incidence of death over the two-year period was 10.5%. and none of the death were attributable to COVID-19 **(Table 2).**

Overall, there was an 18% reduction in the number of surgical procedures performed owing to the COVID-19 pandemic. Specifically, there was a 71.4% reduction in the number of minor procedures, 34.4% reduction in major surgeries, and 22.5% reduction in the number of catheters inserted; however, there was a 52.2% increase in the number of intermediate surgical procedures.

Delayed surgery was associated with a positive SARS-CoV-2 test result (p<0.001) but was not associated with the type of surgery. In addition, 100% of the major surgical cases and 55.6% of the minor surgeries were delayed. but the difference was not statistically significant.

- Among those who tested positive for SARS-CoV-2, 100% of pediatric patients with surgical delays of < 15 days received home care, whereas only 25% with surgical delays > of 15 days were treated at home.

n=15 clinical aspects	COVID POSITIVE Global	Minor Surgery	Major Surgery
Sex			
Female	8	5	3
Male	7	1	6
Age		2	
Under 1 y	2	0	0
2 to 5 y	6	0	6
6 to 11 y	2	4	2
12 to 16 y	5	4	1
Symptoms			
no	5	4	1
yes	10	2	8
Clinics			
Hematology	4	0	4
Pediatrics	11	6	5
Treatment			
at Home	8	5	3
Hospital	7	1	6
Surgery delay			
none	4	0	4
under 15	7	3	4
more than 15	4	3	1
Total	15	6	9

Table 2 This table present results of surgical procedures associated to the epidemiological and clinical aspects of pediatric oncology patients COVID 19 positive.
note: n=number; y=years

- Death was associated with patient´s age group (p=0.007) and was significantly less frequent in patients aged 6 – 11 years (2.1%), whereas the incidence of death was highest in patients aged < 1 year (17.7%). However, there was no significant association between the overall death rate and age (Mann-Whitney test, p=0.067). The age distribution of deaths is shown in **Figure 1.**
- Death was not associated with the presence of COVID-19 symptoms (P=1.000). In addition, there was no significant difference in the incidence of death between patients treated at home and in the hospital (p=1.000).

The characteristics of pediatric oncology patients with COVID-19, by type of surgery; are described below:

- Among patients who tested positive for SARS-CoV-2, there was a difference in sex gender distribution between patients who underwent minor and major surgeries: only 16.7% of patients who underwent minor surgery were male, whereas 66.7% of patients who underwent major surgery were male.
- Among patients who tested positive for SARS-CoV-2, the typical age group of patients who underwent minor and major surgery were 12–16 years and 2–5 years, respectively.
- Among patients with positive test results, COVID-19 symptoms were more frequent in the group requiring major surgery (88.9%), whereas 33.3% of patients who underwent minor surgery experienced COVID-19 symptoms.

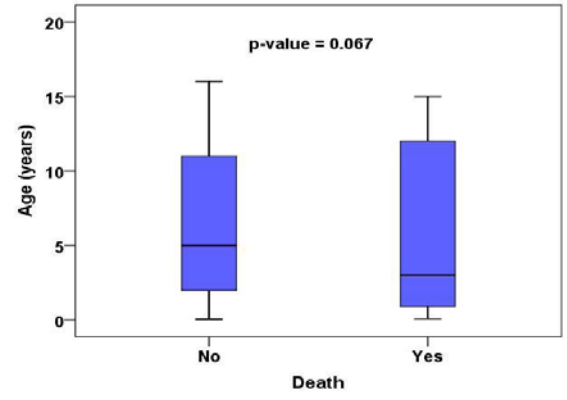

Figure 1 Boxplot of age distribution in subgrours according death.

- Among patients who tested positive for SARS-CoV-2, 16.7% of who required minor surgery were hospitalized for treatment, whereas 66.7% who underwent major surgery were treated in the hospital **(Table 1).**

DISCUSSION

In accordance with the National Health Surveillance Agency in Brazil (ANVISA) guidelines, nosocomial infection control departments determined new barriers to prevent infection and required the use of appropriate personal protective equipment (PPE) while ensuring continuous training of health care and multidisciplinary teams [10].

Early reports describing the impact of COVID-19 in children and adolescents documented that, compared with adults, children have a lower risk of becoming infected with SARS-CoV-2, and the virus typically causes mild disease and rarely leads to hospitalization; an example is the related adult cases of venous thromboembolisms, this clinical situation was not identified in our cases [11]. For pediatric cancers, continuation of treatment and careful evaluation on an individual case basis was advised. International pediatric oncology specialists have summarized the main pediatric oncology diseases and essential recommendations at the early stages of the pandemic for the prevention and management of COVID-19 in the pediatric population [12] and [13], respectively:

National and international oncology study groups have advised care when making a referral for surgery. The American College of Surgeons and the UK National Health Service (NHS) have proposed recommendations including the continuation of elective procedures with no interruption of treatment, in addition to ensuring attention to the treatment periods of chemotherapy, surgery, and radiotherapy [14,15] respectively:

The surgical team had to adapt to the new guidelines and care directives to prevent infection and minimize the effects and complications of SARS-CoV-2 infection in their patients [16].

Patients with a positive SARS-CoV-2 test result or those in whom there was a strong suspicion of infection with an indication for surgery underwent procedures in adapted facilities designed to support their needs [17].

Some studies have suggested reducing chemotherapy doses and increasing the interval between cycles, depending on the patient's condition, the severity of the clinical manifestation of the disease, and the risk associated with chemotherapy. It has also been recommended that high- intensity be postponed treatments where feasible [18-20], respectively.

Other studies have recommended the continuation of standard chemotherapy given the curable nature of most pediatric cancers and current evidence suggesting milder COVID-19 disease courses in children, in addition to the low incidence of COVID-19 in children undergoing cancer treatment [21-24]. Some insights on the impact of the pandemic and on the barriers to cancer care delivery the first and second waves of COVID-19 in Latin America, recent studies reported an improvement and recovery of pediatric câncer services during the second wave [25].

In our cohort of children undergoing surgical treatment, only 8.23% of patients tested positive for SARS-CoV-2. — confirming the low rate of infection in the pediatric population, as reported in the literature — of whom 80% presented with mild symptoms, did not require hospitalization, and received outpatient care [26]. During this period analysis we had an evolution in COVID 19 prevention and treatment, including immunocompromised patients who started vaccination in july 2022. Those patients wasn´t included in this study. More studies are required to assess the safety of these vaccines in young patients [27].

In keeping with the target of the WHO (**2018)** to improve survival from childhood cancer to 60% by 2030, sensible modifications have been suggested, and proposals have been made regarding treatment in pediatric oncology services.

CONCLUSION

The actual impact of the COVID-19 pandemic on pediatric oncology treatment remains unclear. Collective wisdom and careful evaluation of each case and experience from the oncology team can help validate new protocols and determine the best approach for cancer patients during the COVID-19 pandemic, along with advances in treatment and prevention.

Conflicts of Interest and Source of Funding

The authors declare there are no conflicts of interest. This research was approved by the ethical Board in the number CAAE:35444620.6.0000.5274. This research received no external funding.

Data Access Statement

Data cannot be shared due to ethical, legal or commercial restrictions

Authors Contribuition Statement

The Corresponding author of this manuscript is Ricardo Vianna de Carvalho and contribution of the authors as mentioned below with their responsibility in the research. Ricardo Vianna de Carvalho: Supervised research, design, analysis and interpretation of data, assisted with manuscript write up and critically revision for intellectual content and approval for publication. All authors read and gave final approval of the version to be published Rosana Fidelis Coelho Vieira Arissa Ikeda Suzuki and Licia Neves Portela: Contributed equally interpreting results and drafting the manuscript and catalog the patients and charts researches to the design and performed the statistical analysis of the study and participated in clinical data analysis and interpretation.

Bruno César Honório de Albuquerque, Marianne Monteiro Garrido and Norma Albuquerque Girão contribute equal analysing epidemiological aspects of charts and research methods**.** Barbara Carolina Alfradique Batista Godinho, Flavia Claro da Silva, Mileine Maneiro Garabal and Fernanda Costa Capela: participated in surgical procedures and clinical assistance. All authors of this research paper have directly participated in the planning, execution, or analysis of this study; All authors of this paper have read and approved the definitive version submitted;

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