



A Cross-Sectional Study of Unlocking Childhood Cancer Services during COVID-19 Pandemic: A Pediatric Oncology Tertiary Care Center's Experience from a Developing Country

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Abstract

Introduction The global coronavirus disease 2019 (COVID-19) pandemic has made the provision of cancer care services a challenging task all over the world, even in developed countries. Multiple studies have already reported increased rate of diagnostic delays, interruptions in radiotherapy and chemotherapy administration, and shortage of health care personnel to deliver these services.

Objective The aim of this study was to analyze the impact of strategies used to deliver uninterrupted childhood cancer services at our center during the COVID-19 pandemic.

Materials and Methods This is a cross-sectional study of the children less than 18 years of age admitted at our center between March 2020 and September 2021 to assess the effect of strategies adopted to provide uninterrupted cancer services during the COVID-19 pandemic. All the children with cancer who were managed during the study period were included in the study. The children who had treatment interruptions/lost to follow-up prior to onset of COVID-19 were excluded from the study. The primary outcome was to measure the effect of COVID-19 on delivery of cancer care services. The secondary outcome was to assess whether the strategies followed at our center helped to reduce diagnostic delays or loss to follow-up during the COVID-19 pandemic.

Results Out of total 1,490 admissions, 199 children were managed during the study period. Among the 199 children managed, 124 of them were newly diagnosed, 75 had ongoing treatment, 16 children relapsed, 13 children received palliative care, and 6 families were lost to follow-up. Out of 1,471 tests done, only 16 children and 6 caregivers tested COVID-19 positive during routine screening. Thirty-five underwent surgery and 23 received radiotherapy during this period. Among 199 children, 143

Keywords

- ▶ lockdown
- ▶ interrupted childhood cancer care services
- ▶ multilevel supportive care model

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(71.8%) received financial support for hospital expenses, 23 (11.5%) received travel support, 20 (10%) were provided free accommodation, and 15 (7.5%) received home delivery of oral chemotherapy and pain medications. A total of \$86,989.05 was supported for diagnostic investigations, COVID-19 testing, chemotherapy, and supportive care; \$1,144.90 for travel support; and \$17,010.94 was waived off by hospital administration to support the poor families.

Conclusion The shared care model, support from nongovernmental organizations and hospital administration, and utilization of local resources productively and effectively helped to avoid diagnostic delays and treatment interruptions, and provide uninterrupted pediatric cancer care services at our center.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has disrupted the provision of health services and created unprecedented challenges for children with cancer in getting safe and effective cancer-directed therapy all over the world, even in developed countries. With initial reports suggesting that people with comorbidities had poor outcomes, we expected that children with cancer would develop severe disease and have adverse outcomes.¹ This complexity was potentiated by major void in the access to and availability of treatment facilities, and financial constraints due to lockdown.

Childhood cancer is highly curable when promptly diagnosed and appropriately treated. Interruptions in treatment delivery or compromise of intensive therapies are expected to result in treatment failure and increased rate of relapses. But it is also known that viral infections are associated with increased morbidity and mortality in these immunocompromised children. So, at the onset of pandemic, while the treating physicians were outweighing the risk versus benefits of continuing cancer treatment in such an unpredictable scenario, equally worrying were the concerns about dropouts due to travel restrictions, loss of employment, and increased cost of cancer treatments. Hence, we developed strategies anticipating these issues to continue our pediatric cancer care services uninterrupted, and to restrict the diagnostic delays and treatment interruptions to the minimal. We studied the effect of these strategies on newly diagnosed as well as children with ongoing treatment during COVID-19 pandemic.

Materials and Methods

This is a cross-sectional study of the effect of COVID-19 pandemic on delivery of pediatric cancer care services at our center. All children aged less than 18 years with cancer who were admitted at our center between March 2020 and September 2021 were included in the study. Details of age, gender, primary diagnosis, disease status at the time of admission, native place, distance traveled for treatment, travel expenses, and place of accommodation during treatment were collected. Additional details about COVID-19 positivity rate, dropouts, duration of treatment interrupted due to multiple factors, and failure of initiation of treatment

after diagnosis were collected. All the children with cancer who were managed during the study period were included in the study. The children who had treatment interruptions/lost to follow-up prior to onset of COVID-19 were excluded from the study. The primary outcome was to measure the effect of COVID-19 on delivery of cancer care services. The secondary outcome was to assess whether the strategies followed at our center helped to reduce diagnostic delays or loss to follow-up during the COVID-19 pandemic.

Statistical Analysis

All analyses were performed using *Statistical Package for the Social Sciences* software version 20.0. The missing data were addressed by complete case-wise analysis or list-wise deletion.

Results

Out of total 1,490 admissions, 199 patients were managed during the study period from March 2020 to September 2021. The demographic details of the children are provided in **Table 1**. Among the 199 cases, 124 (62.3%) were newly diagnosed and 75 (37.7%) had ongoing treatment. Thirty-five children (17.5%) underwent surgery and 23 (11.5%) received radiotherapy during this period. Sixteen children relapsed (8%). Thirteen children received palliative intent treatment with supportive care without cancer-directed therapy during this period. Eleven children (5.5%) died either due to progressive or refractory or relapsed disease condition during study period. Among 199 patients managed, only 6 (3%) were lost to follow-up. Among the 124 newly diagnosed, only 4 (3.2%) of them did not initiate treatment. Among 1,471 tested, only 16 children (1%) and 6 (0.4%) of the caregivers were found to be positive for infection. All of them were asymptomatic and recovered uneventfully. Among the 16 COVID-19 positive cases, 3 were newly diagnosed acute lymphoblastic leukemias and they were initiated on induction phase after 1 week. The remaining 13 children had a treatment interruption of 10 days. Among the health care providers who were exclusively posted in pediatric oncology unit, only two nursing staff and one doctor became COVID-19 positive and all of them recovered uneventfully. Among 1,490 admissions, 97 were for febrile illness and all of them were found to be negative for COVID-19 infection.

Table 1 Details of admissions during the study period

Variables	n = 199	%
Gender		
Male	108	54.3
Female	91	45.7
Age group (years)		
<1	30	15.1
1–5	69	34.6
5–12	63	31.7
>12	37	18.6
Distance traveled (km)		
<25	61	30.6
<100	39	19.6
100–500	38	19.1
500–1,000	37	18.6
>1,000	24	12.1
Total admissions	1,490	
Leukemia	770	52.0
Solid tumor	720	48.0
Newly diagnosed	124	
Acute leukemia	39	31.5
Solid tumor	85	68.5
Ongoing treatment	75	
Acute leukemia	48	69.6
Solid tumor	27	30.4
Relapsed	16	
Acute leukemia	8	50.0
Solid tumor	8	50.0
Death	11	
Acute leukemia	6	44.4
Solid tumor	5	55.6
Lost to follow-up	6	
Acute leukemia	2	33.3
Solid tumor	4	66.7

Twenty-four families had traveled more than 1,000 km and 37 families had traveled more than 500 km for the sake of their child's treatment. A total of \$4,464.96 was raised by individual contributions toward treatment of these children.

Table 2 Details of financial support

Variables	Amount supported (US \$)
COVID-19 testing, diagnostic tests, metastatic evaluation, chemotherapy, and supportive care (blood products, antibiotics, antifungals, and antivirals)	86,989.05
Travel support	1,144.90
Waiving off hospital fees	17,010.94

Abbreviation: COVID-19, coronavirus disease 2019.

Among 199 children, 143 (71.8%) received support for hospital expenses, 23 (11.5%) received travel support, 20 (10%) were provided free accommodation, and 15 (7.5%) received home delivery of oral chemotherapy and pain medications. The details of financial assistance are provided in ► **Table 2**.

Discussion

The COVID-19 pandemic, the resultant nationwide lockdown, travel restrictions, and financial constraints, all have led to disruption of cancer care services all over the world. The very high infectivity rate and mortality rate during first wave and uncertainty regarding duration of pandemic have further complicated the family's social and psychological fears and added to their hesitancy in accessing appropriate care. Thus, the indirect effects of COVID-19 pandemic strained the health care systems and created barriers for the care continuum of the children with cancer.

But the consoling facts were that asymptomatic COVID-19 infection among pediatric patients was as low as 2.5% and most children did not need admission for infection.²

Though it was presumed initially that children with cancer would be at an increased risk of acquiring COVID-19 infection and develop severe form of the disease like any other viral infections in immunocompromised conditions, but within few months of onset, worldwide data have confirmed that children are less affected and COVID-19 infections in children with cancer are usually mild or asymptomatic and they recover without much interventions.³

At the same time, key stakeholders in treatment of pediatric cancer released consensus statements recommending continuation of standard care in the diagnosis, treatment, and supportive care whenever possible and discouraging elective modifications in cancer-directed treatments.⁴

Ours is a tertiary care center catering to around 100 to 125 new patients per year and we provide chemotherapy to families coming from various economic strata.

During this COVID-19 pandemic, although routine elective inpatient and outpatient services were closed at our center, oncology, perinatal, radiation oncology, emergency, intensive care, and dialysis services were continued. So, when we had decided to continue pediatric cancer care services, the next herculean task was to support families, anticipating their difficulties in accommodation, travel, and financial resourcefulness during the treatment, and also to reduce the risk of COVID-19 infections both for patients and the health care team. Hence, we formulated a multilevel supportive care approach to help the families manage the

financial toxicity and help them in all possible ways so that they could continue their child's treatment with minimal risk to families as well as the health care community.

- **Tiara Haemophilia and Cancer Foundation:** The primary nongovernmental organization (NGO) that supports the cancer treatment of poor children at our center agreed to sponsor for the COVID-19 testing and supportive care in addition to supporting the diagnostic tests, metastatic evaluation, and chemotherapy drugs. They have supported a total amount of \$67,808.66.

- **Golden Butterflies Children's Palliative Care Foundation:** An NGO that provides palliative care, counseling, medical aid, and financial assistance to families with children suffering from chronic and incurable diseases, supported the transportation expenses for those families who had to travel from other states/districts for their child's treatment and arranged for home delivery of pain medications.

- **St Jude India Child Care Centre:** An NGO that provides safe and hygienic housing facilities and free transport to and from treatment centers, provided free accommodation in their "Home away from home" center for 18 families and arranged for free transportation from the centers to the treating hospitals.

- **CanKids:** A national NGO that provides holistic support to child with cancer and family from the point of diagnosis, through treatment, and after, arranged for home delivery of oral chemotherapy drugs and provided free accommodation for three families.

Thus, all aspects of probable dropouts—medical, accommodation, and travel expenses—were taken care of, to limit treatment abandonment. In view of additional expenditure to support these children, additional funds to the tune of \$4,464.96 were generated by means of contributions from staff and students from the institution and good-hearted people all over the world.

Though COVID-19 infection in children with cancer has been mostly mild or asymptomatic, the collateral effects have dramatically disrupted the diagnosis, treatment, and follow-up of these patients, which may in turn affect their overall survival and outcomes. Italy has reported a 50% decrease in new pediatric cancer cases when compared with previous years.⁵

With hospitals catering only to COVID-19 patients, combined with lockdowns, restricted transportation, and families' reluctance to seek care, diagnostic delays and fragmented care in children with cancer have been reported in high-, middle-, and low-income countries.⁶

Graetz et al in his cross-sectional survey across 79 countries have reported that 7% of centers had a complete closure for a median period of 10 days, 2% had stopped evaluating new cases, 34% centers had treatment abandonment, and 28% had interruptions in radiotherapy.⁷ Pediatric Oncology East and Mediterranean group has reported that 24% of centers restricted admissions of new cases, and delays in treatment—chemotherapy, surgery, as well as radiotherapy—were reported in 29 to 44% of centers.⁸

In contrast, Germany has reported a higher incidence of new cases across all diagnostic groups and that diagnostic processes, timeliness of diagnosis, and delivery of treatment were hardly affected during the pandemic.⁹ Mukkada et al in the cohort study from 131 institutions across 45 countries have reported that 55.8% had an interruption in the cancer-directed therapy.¹⁰ A report from Saudi Arabia has quoted 60.5% delay in the treatment received for children with cancer.¹¹

To reduce the risk of infection, we strategized effective and sustainable preventive measures to prevent infections among health care workers. All children and attenders were screened for COVID-19 infection prior to admissions. Dedicated group of doctors and nursing staff were posted in oncology units and they were exempted from regular COVID-19 ward duties. The working group was divided into two groups that worked on alternate basis to minimize the risk of exposure. To prevent unnecessary exposure to asymptomatic carriers, attenders accompanying patients were restricted and only one attender was allowed to stay with the child throughout the admission period. The numbers attending out patient were streamlined and given slots to avoid overcrowding. Number of admissions per day was restricted to maintain social distancing in the wards. Doctors and nurses were strictly adhering to compliance of personal protective equipment and other World Health Organization recommended safety measures. Families were emphasized to practice standard precautions for basic and respiratory hygiene and avoid sick contacts. Children presenting with fever or COVID-19-like symptoms had separate pathways for management until they were proven to be COVID-19 negative. Survivor clinics were canceled and online consultations were arranged for children who had completed therapy and for those who had minor complaints while on active treatment. A total of 401 online consults were made. Only two of our nursing staff and one doctor acquired COVID-19 infection and all of them recovered with a mild illness.

For those children who needed less intensive chemotherapy, we developed a strategy of shared care, in coordination with the oncologists or pediatricians nearby their residence. A total of 37 admissions were arranged near their native places. Permission letters to families were issued to facilitate the travel between states.

No diagnostic delays or interruptions in radiotherapy were noted for the children managed during this period. There were no shortage of blood products or chemotherapy drugs and routine supportive care was not compromised for any child.

Families with newly diagnosed children and who were coming from long distances faced difficulties in getting accommodation nearby the treating center. So, we sought the help of NGOs who provided them free accommodation facilities and transport services. Around 24 families had traveled more than 1,000 km and 37 families had traveled more than 500 km during the lockdown period for the sake of their child's treatment. Due to the complete lockdown and nonavailability of trains and buses, families had to spend an

exorbitant amount for transport, but the NGOs offered to support the travel expenses.

The major socioeconomic impact of the pandemic was reduction/loss of income, thereby making cancer treatment unaffordable for most of the families. With the inputs from NGOs and individual sponsors, a total of \$86,989.05 was supported for chemotherapy, diagnostic/metastatic investigations, and supportive care during febrile neutropenic periods and COVID-19 testing. An amount of \$1,144.90 was supported for travel expenses and \$17,010.94 was supported by the hospital administration by waiving off the bed charges.

Mahajan et al have reported that shared care through an NGO CanKids, which sponsored for diagnostic, chemotherapy, radiotherapy, surgery, and supportive care, has helped 55 children with cancer from 5 different hospitals to continue their care uninterrupted from April to November 2020.¹² Seth et al have reported that strict preventive measures followed inside hospital, usage of teleconsults, treatment modifications according to the risk status of the patients, proper utilization of human resources, and involvement of NGOs for transport, accommodation, and delivery of drugs have helped them to deliver pediatric oncology services during the pandemic.¹³ In a study from a tertiary care center in North India, whose patients travel around 500 km, chemotherapy was administered at home or in the neighboring hospitals by the pediatricians, thereby avoiding interruptions and long travels.¹⁴ Balduzzi et al highlighted the importance of having clean and COVID-19 pathways for children to prevent cross-infection in the hospital.¹⁵

As a result of this multilayered supportive care model, we were able to cater to the needs of 124 newly diagnosed children and 75 children with ongoing treatment. The extensive financial support in the form of providing free accommodation, and sponsoring for travel expenses and chemotherapy, had helped us to maintain a lowest rate of dropouts (3%) during the study period. There were no diagnostic delays for newly diagnosed cases and no interruptions in radiotherapy were noted during the study period.

Limitations

It is a single institutional study with a small sample size.

Conclusion

To conclude, with the support from hospital administration, shared care with pediatricians, and involvement of NGOs and support groups, we can deliver uninterrupted cancer care services even during periods of crisis like COVID-19 pandemic.

Ethics

The Institutional Ethics Committee of Sri Ramachandra Institute of Higher Education and Research (IEC-NI/21/FEB/77/15(COVID-19)) approved this study. The procedures followed were in accordance with the ethical standards of

the responsible committee on human experimentation and with the Helsinki Declaration of 1965, as revised in 2013. Informed patient consent was obtained prior to enrolment.

Funding

None.

Conflict of Interest

None declared.

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