

Critically Ill Pediatric Oncology Patients: A Difficult-to-treat Population

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Keywords: Children, Critical care oncology, Hemato-oncology.

Indian Journal of Critical Care Medicine (2021): 10.5005/jp-journals-10071-24017

Pediatric critical care has made large strides in the past several decades, resulting in better outcomes over the years.¹ However, children with malignancies who become critically ill and require intensive care unit (ICU) care lag behind their non-oncologic peers in terms of pediatric intensive care unit (PICU) outcomes.

Children with malignancy are often a low priority for PICU admission as the allotment of beds to these children is seen as a waste of resources. However, over the years the outcome of these critically ill children has also improved.² Changes in strategy to treat these patients, such as early institution of non-invasive ventilation (NIV) for respiratory failure, aggressive management of shock, continuous renal replacement therapy, and blood component support, have resulted in better outcomes among children with malignancies requiring PICU admission.

Outcomes from intensive care depend to a large extent on pre-morbid and comorbid conditions.¹ The same is true in children with malignancies too. Many of these children are undernourished and immunosuppressed, and hence, their outcome is compromised when they become critically ill.

In this issue of the *Journal*, Bhosale et al. present their data on outcomes of children with malignancies admitted to their ICU.³ The authors have retrospectively analyzed the data of 200 children who required non-elective admission to the ICU for various different conditions. Since there is a referral tertiary care oncology hospital, the number of children admitted over a year is substantial. These children required a host of supportive management, thus highlighting the “burden” of illness and care. What is highly commendable is that these children were admitted to an ICU that caters to children and adults, much unlike most other centers where children would be looked after in a pediatric ICU.

Critical care involves organ support, as is true for pediatric critical care too. It is completely logical that the more the number of organ supports required, the higher is the mortality. Respiratory failure requiring invasive mechanical ventilation,⁴ shock and especially septic shock,⁵ disseminated intravascular coagulation (DIC) and multi-organ failure⁶—all add morbidities and increase the mortality. The findings by Bhosale et al, hence, come as no surprise that children with need for invasive mechanical ventilation, inotropes for shock management and those with coagulopathy fared worse than children without these needs.”

The authors draw attention to the high ICU mortality and hospital mortality. This is higher than the PICU mortality of children in our country, i.e., between 5 and 30% (personal communications).^{7,8} This is quite understandable considering the difficulties faced by children with malignancies for treatment in our country. Financial and other

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How to cite this article: Poddar B. Critically Ill Pediatric Oncology Patients: A Difficult-to-treat Population. *Indian J Crit Care Med* 2021;25(10):1091–1092.

Source of support: Nil

Conflict of interest: None

logistic obstacles are innumerable, and hence, this exaggerated mortality is not a reflection of the critical care *per se*.

A large proportion of the children reported in this study (78%) required mechanical ventilation and a substantial number required cardiovascular support (45.5%). Another significant form of organ support required by these children was transfusions. While the authors have correlated these organ failures to outcomes, it is important to recognize that when planning to create facilities to look after children with malignancies, preparation for these organ supports is required.

Children with hematological malignancies consistently fare worse than children with solid tumors, as has also been found in the study. The former children require more aggressive chemotherapy and often bone marrow transplant, thus increasing their chances of infection and adding to the degree of undernutrition. An evaluation of severity of illness scores at admission, either PRISM III, PIM3, or pSOFA score^{9–11} would have added value to the study and helped in understanding whether these scores help in prognostication of children with malignancies too.

Respiratory support in the form of NIV and humidified high-flow nasal cannula (HFNC) oxygen are attractive options for patients with malignancy as the complications of endotracheal intubation, especially of nosocomial pneumonia can be avoided.¹² In the study by Bhosale et al., details of respiratory failure such as oxygenation parameters (PaO₂:FiO₂ ratio or oxygenation index), presence of respiratory acidosis at admission, duration of ventilatory support would have added to the understanding of the severity of respiratory failure and hence the final outcome. The retrospective nature of the study probably precluded these analyses.

Septic shock is a common reason for PICU admission and is associated with a high mortality and poor prognosis.⁵ This is

more so in postchemotherapy children who often have febrile neutropenia and/or infections with opportunistic organisms and multidrug-resistant (MDR) organisms. Myocardial dysfunction is not uncommon in septic shock.¹³ Many of the chemotherapeutic agents used, especially for hematological malignancies, are cardiotoxic leading to cardiomyopathy. Hence, when children treated for malignancies present with septic shock, they are more likely to have cardiac failure requiring inotropes. The study by Bhosale et al. found that the need for inotropes was strongly associated with mortality. Further details such as the presence of neutropenia, the stage in malignancy when they presented with shock (e.g., postinduction), the cardiotoxic drugs received by the patients, and the organisms isolated in those with septic shock would have been useful.

In the study by Bhosale et al., coagulopathy was found to have a uniformly poor outcome. DIC in critically ill patients portends a poor prognosis and the same was found in the children with malignancies. In addition, thrombocytopenia, possibly a result of drugs and/or bone marrow suppression, has a worse prognosis.

Among the oncological emergencies requiring ICU admission, tumor lysis syndrome is a frequent one. We find no details of this in the study by Bhosale et al. and also the details of renal replacement therapy. Children who underwent hematopoietic stem cell transplantation have not been included in the study, an important limitation, as is rightly pointed out by the authors.

While this study brings out the short-term outcome of children with malignancies when they were critically ill, a long-term outcome is equally important. A sizeable number of children had encephalopathy at ICU admission (23%); PICU patients with neurological illness tend to have a poor long-term outcome.¹⁴ This would only be possible in a prospective study. So, while the study by Bhosale et al. is much appreciated for highlighting the critical care needs of a population of children with malignancies, we look forward to a prospective study on the same topic, preferably including data from several centers across India.

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