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RESEARCH ARTICLE

PATTERN OF ADMISSIONS INTO PEDIATRIC INTENSIVE CARE UNIT IN A TERTIARY CARE CANCER CENTER IN SOUTHERN INDIA

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ABSTRACT

Background: Pediatric intensive care unit (PICU) is an important component of the supportive care for the children being treated for cancer. The aim of this study was to review the commoner malignancies requiring PICU admissions at our centre, the reason for PICU admission, their microbiological data and to have a brief idea of outcomes of each individual malignant case admitted to PICU. **Methods:** A retrospective review of the cases who were admitted in PICU at Kidwai Memorial Institute of Oncology, Bangalore from July 2017 to December 2017 was done. Data was collected from the patients case files and the PICU registry. **Results:** There were a total of 127 cases admitted to our PICU. The mean age of the children admitted was 8.3 years ranging from 8 months to 14 years. There were 79 boys and 48 girls with male:female sex ratio of 1.6:1. The duration of stay in PICU of the children ranged from 1 day to 30 days. Acute lymphoblastic leukemia was the most common malignancy requiring PICU admission and febrile neutropenia with sepsis being the most common cause. Totally there were 39 deaths in our PICU during the study period and approximately 50% of the deaths were due to sepsis. **Conclusions:** Children with hematologic malignancies formed a major part of our PICU admissions. Sepsis has still been the most common cause warranting intensive unit care in our setting like any other developing country and also of the mortality.

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INTRODUCTION

Cancer although rare in pediatric age group, it is a significant cause of morbidity and mortality in developing countries. Survival approximations vary between 10% and 50% (Rodriguez-Galindo, 2015). Over the past 20 yrs, there have been dramatic improvements in 5-yr survival in children with cancer, largely due to advances in treatments resulting in cure or long-term remission. One of the important aspects of treatment which has made a difference in the favourable outcomes is the supportive care of these children. Pediatric intensive care unit (PICU) is an important component of the supportive care as it is estimated that approximately one of every three to four children diagnosed with cancer are admitted to the PICU at least once during their illness (Rosenman, 2005). It is very important to identify the patients who need intensive care. However the lack of specialised and advanced services at PICU in low and middle income countries will pose difficulty in the improved survival outcomes.

The aim of this study was to review the commoner malignancies requiring PICU admissions at our centre, the reason for PICU admission, their microbiological data and to have a brief idea of outcomes of each individual malignant case admitted to PICU.

MATERIALS AND METHODS

A retrospective review of the cases who were admitted in PICU at Kidwai Memorial Institute of Oncology, Bangalore from July 2017 to December 2017 was done. Our institute is a tertiary cancer care centre located in southern part of India. We have a 6 bedded PICU, exclusively dedicated to pediatric oncology patients and is managed by pediatric oncologists. The decision of admission to PICU was mostly made after discussion among the senior consultants of the unit. Data was collected from the patients case files and the PICU registry. Data included demographic parameters such as age, sex, primary diagnosis, the phase of treatment and the reason for

admission to PICU. Each diagnosis was given a different code for the data entry, those who were still under diagnostic evaluation, and of unknown diagnosis were referred to as 'others'. The date of admission and the date of discharge was noted. The status at discharge was noted as discharged after recovery, death or discharged against medical advice. During the time of stay in PICU, the need of ventilation and the microbiological data including blood culture, pus culture, throat swab cultures were documented along with their sensitivity pattern of antibiotics. Organ system dysfunction and sepsis were defined according to the international pediatric sepsis consensus conference: definitions for sepsis and organ dysfunction in paediatrics (Goldstein, 2005).

This study did not measure the outcomes of our PICU admissions as a larger sample over a larger period of study was warranted for the same. The cases who got admitted during the study period but extended their stay in PICU beyond the study period were also included. The data was entered in Microsoft Excel and was analysed.

RESULTS

During the study period of 6 months, there were a total of 127 cases admitted to our PICU. The mean age of the children admitted was 8.3 years ranging from 8 months to 14 years. There were 79 boys and 48 girls with male: female sex ratio of 1.6:1. The duration of stay in PICU of the children ranged from 1 day to 30 days. The primary diagnosis of the cases admitted were as represented in the Table 1. There were 16 different cases admitted during the study period with the most common malignancy being Acute lymphoblastic leukemia and 4 cases were still under evaluation but succumbed before a complete diagnosis could be made.

The reasons for admission of these cases into PICU were varied as represented in the Table 2. The most common causes were febrile neutropenia with sepsis followed by respiratory distress. The causes of respiratory distress were infection, hyperleucocytosis and as a part of superior mediastinal syndrome. The third most common cause for PICU admission of the cases was neurological issues like seizures secondary to Posterior reversible encephalopathy syndrome (PRES), cortical vein thrombosis, intracranial bleed, raised intracranial pressure. Most of the cases who had progressive disease succumbed to a neurological event. Totally there were 8 cases of documented sepsis with distinct organisms grown in the culture of blood, urine and throat swab. Another 43 cases of febrile neutropenia with sepsis did not grow any organisms. All the organisms were gram negative being Klebsiellapneumoniaein 3cases, E coli in 3 cases and Pseudomonas aeruginosa in 2 cases. Totally there were 39 deaths in our PICU during the study period. The number of deaths of each malignancy with the survival rates is as represented in the table 2. The most common cause for death was found to be febrile neutropenia with sepsis. 10 children went on discharge against medical advice and the rest 78 children are alive and on regular follow up.

DISCUSSION

The outcomes of malignancy in pediatric age group has improved dramatically over the past 3 decades. Risk based chemotherapy and intensive treatment protocols have contributed largely to this. However as a consequence children would develop severe myelo suppression and life threatening infections. Hence pediatric intensive care units have a huge role to play in the supporting care of these children. Over the past 15 years several groups have reported the outcome of patients with malignant disease admitted to intensive care units for treatment.

Table 1. Primary diagnosis of all the cases admitted to PICU unit with the survival rate of each type of malignancy

Primary Diagnosis	Number of cases admitted to PICU	Survival of each malignancy
Acute lymphoblastic leukemia	56	42 (75%)
Acute myeloid leukemia	26	18 (69.2%)
Acute promyelocytic leukemia	6	3 (50%)
Burkitts lymphoma	5	2 (40%)
T lymphoblastic lymphoma	5	2 (40%)
Osteosarcoma	5	5(100%)
Rhabdomyosarcoma	4	1 (25%)
Brain tumors	3	2 (66.7%)
Anaplastic large cell lymphoma	3	2 (66.7%)
Wilmstumor	2	2 (100%)
Neuroblastoma	2	2 (100%)
Germ cell tumor	2	1 (50%)
Diffuse large B cell lymphoma	1	1 (100%)
Hodgkins lymphoma	1	1 (100%)
Ewings Sarcoma	1	1 (100%)
Hepatoblastoma	1	1 (100%)
Others (Undiagnosed)	4	2 (50%)
Total	127	

Table 2. Causes of PICU admission with their survival rates

Reason for PICU admission	Number of cases	Survival
Febrile Neutropenia with Sepsis	51	32 (62.7%)
Respiratory Distress+	40	29 (72.5%)
Tumorlysis syndrome	17	15 (88.2%)
Neurological problems [§]	14	9 (64.3%)
Pancreatitis	3	2 (66.7%)
Gastrointestinal bleed	1	0 (0%)
Post surgery	1	1 (100%)

+ Causes of Respiratory distress: Infection, Hyperleucocytosis, Superior mediastinal syndrome, progressive disease with lung metastasis § Neurological problems: Posterior reversible encephalopathy syndrome, Cerebral venous thrombosis, Intracranial bleed

Unfortunately, most of these studies were on adults⁴ and only a few reports are on children (Heney, 1992). This study was conducted to know the pattern of admissions into our PICU including their diagnosis, the reason for PICU admission, their microbiological data and to have a brief idea of outcomes of each individual malignant case admitted to PICU. We had a total of 127 admissions into our PICU over the study period of 6 months and reflects the huge burden of cases requiring intensive monitoring as compared to other centres. Faraci et al. documented a PICU admission rate of 4.2%, with a 2-year cumulative incidence of 4.5%.⁶ Owing to the larger incidence of hematologic malignancies in children, the PICU admissions were also dominated by Acute lymphoblastic leukemia followed by Acute myeloid leukemia. These admissions were mostly during the intensive phase of chemotherapy as compared to solid tumors chemotherapy which are less myelotoxic. Heney et al. also had a predominance of ALL in their study over a period of 6 years describing the admissions of their intensive care unit (Heney, 1992).

Systemic sepsis in neutropenic patients and respiratory distress have been the most common cause of our PICU admissions highlighting the burden of sepsis which is still prevalent in our country. The same causes have been reported in many of the studies from developing countries (Khan Sial, 2019). Neurological concerns have also been one of the commoner causes requiring PICU admissions in our study. Keengwe et al. also showed the neurological causes to be the third most common causes of PICU admission in their oncology unit (Isaac, 1999). Though sepsis was the cause for 40% of our PICU admissions, microbiologically positive cultures were noted in only 15% of them. All the positive 8 cultures were noted to be gram negative organisms in contrast to the study by Garcia et al. which had equal numbers of gram positive and gram negative organisms grown in the positive cultures (Fernández-García, 2015). There were 39 deaths in total during the study period in our PICU.

The point to be stressed is that sepsis has still been the major cause of mortality accounting for almost 50% of our deaths. Howell et al. also stated Pediatric Risk of Mortality scores and predicted mortality, as well as actual mortality, were higher for patients with sepsis vs. those without sepsis (Howell, 2011). It is difficult to draw the conclusions on the overall outcome of our PICU admissions in this study owing to the smaller sample size and smaller duration of the study. Children with hematologic malignancies formed a major part of our PICU admissions owing to their intensive chemotherapy and myelosuppression. Sepsis has still been the most common cause warranting intensive unit care in our setting like any other developing country. However the decision for PICU admission should involve the intensivists, the hematologists, the family with consideration of their social and emotional situations. Prospective, multicenter studies would lead to a better understanding of this population's specificities and optimize the admission strategies as well as the management of these children in the PICU.

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Conflicts of interest: None

Key Points

- Children with hematologic malignancies formed a major part of our PICU admissions.
- Sepsis has still been the most common cause warranting intensive unit care in our setting
- Microbiologically positive cultures were noted in only 15% of the cases of sepsis, and all being Gram negative organisms
- Sepsis accounted for 50% of our PICU mortality

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