

Management and Immediate Outcome of Common Pediatric Oncological Emergencies: A Single-Center Prospective Study

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Background and objective: The initial presentation of childhood malignancies is often an emergency. Timely recognition and effective management of pediatric oncological emergencies are crucial for improving patient outcomes. This prospective study aimed to investigate the nature of oncological emergencies, emergency management strategies, and immediate outcomes in children presenting with these events.

Material and Methods: This prospective study was conducted on 83 children with 110 visits, with a median age of 6 years. Data collected included the nature of the oncological emergency, emergency management, and immediate outcomes.

Results: Leukemia was the most common malignancy, accounting for 50.6% of cases, with 92.8% being acute lymphocytic leukemia. Intracranial malignancies constituted 26.5%, with 59% of these being posterior fossa tumors. The most frequent presenting symptoms included fever (36.4%), severe anemia (18%), febrile neutropenia (16.45%), tumor lysis syndrome (TLS) (8%), and respiratory distress (4.5%). Neurological symptoms were present in 31% of patients. Emergency management included parenteral antibiotics in 42.7% of cases, packed cell transfusions in 16.4%, and intensive care admission in 26.5%. Twelve patients required neurosurgical procedures. Blood cultures were negative in 90.4% of cases.

Conclusion: This study highlights the diverse nature of pediatric oncological emergencies. Effective management often involves a multidisciplinary approach, including supportive care, antibiotics, transfusions, and intensive care. While blood cultures are often negative, early identification and appropriate treatment are essential for improving immediate outcomes in children with oncological emergencies.

Introduction

Aim

To study the type, clinical presentation, emergency management and immediate outcome of oncological emergencies.

Method

Prospective study including children, 1 yr to 18 years of age, presenting with oncological emergencies to the emergency department between January 2019 and October 2021. Clinical presentation, laboratory and treatment details were documented and analysed.

Results

There were 83 patients, 110 visits and 27 readmissions. 61.44% (n=51) were males 38.5% (n=32) females. Median age was 6 and 37.34 % (n=31) between 1- 5 yrs, 2.4% (n=2) < 1yr. Leukemia constituted 50.6% (n=42), 92.8% (n=39) of these were acute lymphocytic. 7 had leukemic relapse, one of them after BMT (bone marrow transplant). 26.5% (n=22) were intracranial malignancies 59% (n=13) of these were posterior fossa tumors. 50% (n=11) of intracranial tumors were medulloblastomas. Lymphomas and Ewings sarcoma formed 6% (n=5 each) of total patients. Fever was the presenting complaint in (n=40) 36.4% of 110 visits to the emergency, 18% (n=20) had severe anemia and 16.45 % (n=18) febrile neutropenia, 8% (n=9) with TLS, 4.5% (n=5) had respiratory distress as the presentation Neurological symptoms such as seizures, abnormal neurologic manifestations, headache & vomiting were presenting symptoms in 31% (n=34) of visits. Parenteral antibiotics were administered in 42.7% (n=47) of visits. 90.4% (n=38) of blood cultures were negative (n=38). Packed red cells were transfused for 16.4% (n=18). Intensive care was needed in 26.5% (n=22), 12 children underwent a neurosurgical procedure, 8.4% (n=7) of them required emergency neurosurgical procedure. There were 2 deaths, none in the emergency setting (Table 1).

Type of malignancy	
Leukemia	42
Acute lymphocytic leukemia	38
CML	1
AML	2
JMML	1
Others	
LCH	3
Hodgkins	2
non hodgkins	3
Ewings	5
Hepatoblastoma	1
Neuroblastoma	1
Osteosarcoma	1
Rhabdomyosarcoma	2
Wilms	1
Emergency presentation	
Fever	40
Severe anemia	20
Febrile neutopenia	18
Abd pain, distn,diarrhea	14
Tumor lysis	9
Bleeds	6
Resp emergencies	5
Shock	2
Treatment	
Intravenous antibiotics	47
Blood products transfusion	18
Dexamethasone	8

Intercostal drainage	3
Blood culture	
Culture negative	38
Aspergillus niger	1
Enterobacter	1
Kleibsiella	2
Galactaomannon serum	
Pseudomonas	2
COVID positive	1
CNS TUMORS	
Type of malignancy	
Intracranial tumors	22
Posterior fossa tumors	13
Meduloblastoma	11
Brainstem glioma	3
Pituitary non germcell tumor	2
Non germinomatous tumor	2
Pilocytic astrocytoma	1
parieto ocipital glioma	1
Germinoma	1
CNS TUMORS	
Anaplastic ependymoma	1
Symptoms at presentation	
Neurological symptoms	13
Seizures	11
Headache & vomiting	10
Treatment & Outcome	
Neurosurgical procedure	12
To OT from ER	7
Dexamethasone	8
PICU	22
Deaths	2

Table 1. Types of Malignancies, Clinical Presentation, Treatment and Outcome.

Discussion

Cancer is diagnosed in approximately 2 in every 10,000 patients in pediatric emergency department [1,2]. Oncological emergencies can either be complications of the malignancy or its treatment. Early recognition and prompt management of these emergencies is crucial for an optimal outcome. Leukemias are most common among childhood malignancies presenting to hospital and we observed 50% of oncologic emergencies were in children with leukemia, especially acute lymphocytic leukemia (93%) [3]. Children with leukemias present to the emergency department either with fever, severe pallor, febrile neutropenia or gastrointestinal symptoms. Possibility of febrile neutropenia should be considered in children with malignancies especially those who are on chemotherapy and appropriate antibiotics should be commenced in the emergency department without delay, after obtaining cultures to prevent progression to life threatening systemic sepsis. Antibiotic can be individualized based on clinical findings and local susceptibility or at least broad- spectrum beta-lactam with antipseudomonal coverage must be started once the diagnosis is made [1,4]. Only 10-30% of neutropenic fevers yield a microbiologic diagnosis [5]. A study conducted by Mohamed WA, Daef EA, Elsherbiny showed that blood stream bacterial infection was detected in 29.4%. However, our study showed 9.6% of culture positivity [6]. Siddaiahgari S reported Ecoli and pseudomonas being common gram negative and both methicilin

sensitive and methicillin resistant staphylococcus common gram positive bacteria in oncologic patients with febrile neutropenia in a single tertiary care center study [7]. Severe anemia a life threatening complication of pediatric leukemia requires emergent blood transfusions and platelet transfusions are indicated when there is a risk of serious bleeding [8]. Easy access to leucodepleted and irradiated blood products is vital in the emergency setting. TLS defined as hyperkalemia, hyperphosphatemia, hyperuricemia, and hypocalcemia. is an emergency in about 30% of patients with non-Hodgkin lymphoma [9]. It occurs following initiation of therapy or as the first presentation even before the diagnosis and has to be identified and managed without delay. Hyperleucocytosis commonly defined as a WBC count of greater than 100,000/mL (>100 10⁹/L). causes leukostasis and decreased tissue perfusion and is a high risk for tumor lysis. Immediate and appropriate intervention prevents lifethreatening neurologic and pulmonary complications, cardiac failure, arrhythmias, DIC and renal failure [10-12]. Fluid management and initiating allopurinol or rasburicase should be carried out in the emergency setting with serial monitoring of the serum TLS markers like electrolytes, uric acid, phosphate and renal function. Respiratory emergencies occur either due to airway compression by mediastinal mass, pneumothorax, pneumonia or CNS causes such as seizures or altered sensorium. The first presentation of an anterior mediastinal mass can be a respiratory emergency and often the severity of airway compromise is not proportionate to the degree of symptoms. Compression of the superior venacava presents as orthopnea. Diagnosis and treatment involves least disturbance to the child and may require empirical corticosteroids and support from airway specialists. This critical condition necessitates prompt recognition, preparation and planning to manage a difficult airway [10-13]. CNS (Central nervous system) tumors are common next to leukemias in children and constituted 26.9% [14]. Headache is a common symptom in CNS tumors, however nonspecific and intermittent symptoms can delay diagnosis and these children with raised intracranial pressure are at a risk of deteriorating rapidly [15,16]. Posterior fossa tumors, commonly medulloblastoma, obstruct the CSF pathway and recognizing early subtle signs and symptoms of this emergency ensures a better outcome. Availability of neuroimaging and neurosurgical and pediatric intensive care facilities is vital for the golden hour management of ICP (Intra cranial pressure) in the emergency setting. Parenteral steroids and measures to reduce ICP is imperative. Emergency presentation of solid tumors that arise in the abdomen are uncommon and include hypertension in neuroendocrine tumors and paraneoplastic syndromes [1].

In conclusion, multicentric study to identify challenges faced in the emergency management of children with oncological disease will contribute towards better management and outcome.

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Contributions

Radhika Raman- study conception, design, supervision data collection, analysis, manuscript writing and review.

Sreenidhi Ramakrishnan - data collection, analysis, manuscript writing and review Lakshmi Muthukrishnan- data collection, analysis, manuscript design and review.

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