

ORIGINAL RESEARCH

A Cross Sectional Study to Assess the Bacterial sepsis among Pediatric Patients of Haematological Malignancy

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ABSTRACT

Acute leukemia is the most common pediatric hematological malignancy. Bloodstream infections (BSIs) are severe complications in these patients during chemotherapy. This study Microbiological characteristics of BSIs in Children of hematologic malignancy. All Pediatric patients of Hematological Malignancy aged < 18 years, were include in the study. Study was conducted in Department of Pediatrics and Microbiology of a tertiary care Hospital. Study duration was 1yr from August 2021 to July 2022 after approval from Institutional Ethics committee. A total of 117nonduplicate different samples were collected from 100 patients and processed for bacteriological culture. A total of 33 bacterial isolates were grown. *Pseudomonas* and *Staphylococcus* were most common isolates from blood and *E.coli* from Urine specimens.

Key Words: Sepsis, Haematological Malignancy, Blood culture

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INTRODUCTION

Infections are the main cause of morbidity and mortality in patients with cancer or undergoing stem cell transplantation. Children and adults with hematologic malignancies are especially susceptible to bacterial, fungal, and viral infections due to abnormality of the basic mediators of immunity [1].

Advances in antimicrobial prophylaxis and chemotherapy have decreased the disease severity and improved the survival rate. Infectious complications are still the major causes of morbidity and mortality in hematological and oncological patients[2]

Bacteria represent the immediate threat to most immunocompromised hosts. Bloodstream infections (BSIs) are still the cardinal infections through the course of chemotherapy in leukemic patients and may lead to fatality, even if antibacterial/antifungal prophylactic regimens have been administered. To improve the care quality and survival of leukemia patients with BSIs, it is important to understand the risk factors for BSI during the course of chemotherapy for highrisk patients. The aims of this study were to explore the clinical manifestations, laboratory data, systemic complications, and microbiological characteristics of BSIs in pediatric leukemic patients.[3]

Despite significant advances in supportive care, infection remains second only to malignancy as a cause of death in pediatric oncology patients, and infection accounts for a large fraction of treatment-related costs. Multiple risk factors contribute to infection-related morbidity, chief among them the immunosuppressive effects of leukemia itself and of cytotoxic chemotherapy [3]

Hematological malignancies are a collective term for neoplastic disease of the hematopoietic and lymphoid tissue and are clinically presented as leukaemia, lymphoma, and myeloma. The leukaemias are the most common malignant neoplasms in childhood, accounting for approximately 31% of all malignancies that occur in children younger than 15 years of age[4] Chemotherapy is the mainstay of treatment of acute leukaemias which includes an induction phase, consolidation phase, an interim maintenance phase followed by delayed intensification and maintenance phase.

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improve the care quality and survival of leukemia patients with BSIs, it is important to understand the risk factors for BSI during the course of chemotherapy for high-risk patients.(5)

In advent of same we designed and conceived the present study in a tertiary care centre aiming to study and define the clinical and etiological profile of infections in patients of haematological malignancies among paediatric age group. Thus, leading us to formulate an institutional level recommendation for early intervention and management policy.

In a resource limited settings as ours, specific knowledge about infections and their causative agents will improve the supportive care and eventually the disease outcomes. Unfortunately, there is a real paucity of epidemiologic data on paediatric cancers in India and particularly in Central.

AIM

Study was designed to assess the bacterial infections among pediatric patients of haematological malignancy.

Study setting

Patients aged < 18 years, diagnosed with Hematological Malignancy at the Department of Pediatrics, from August 2021 to July 2022 were enrolled and when presenting with signs and symptoms of infection, a detailed clinical history was taken and a thorough physical examination was done to find the focus of infection. A clinical case report form was filled at this stage to record all the relevant details including type of leukemia and phase of chemotherapy being received. Culture specimen was taken from the PICC line and peripheral blood at the onset of fever, cultures were also taken from other sites whenever clinically indicated.

Infectious episodes were categorized as microbiologically or clinically documented infections (MDI/CDI) or as fever of unknown origin (FUO).

The study was carried out in the Department of Microbiology in association with Department of Pediatrics of a tertiary care hospital.

Study design

A Cross sectional observational study.

Study sample

Sample size was 100 patients.

Inclusion criteria

All children (under 18 years) newly diagnosed or known cases of haematological malignancies presenting with signs and symptoms of infections.

RESULT AND DISCUSSION

The study was conducted on 100 patients admitted to our paediatric haematology unit of after applying inclusion criteria. 58% of our study population were boys and 42% girls, [Image-1] with a slight male

preponderance, similar to the results of the study done by Yao JF, Li N, Jiang J.(6,7) in Beijing's Children Hospital, China. This male preponderance is reflecting the overall sex disparity in seeking care in our region. The mean age (SD) of patients in our study was 5.67 (3.07) years, which was 5.87 ± 4.01 years in study conducted by Rajeswari, et al. Li SD et al(7) had maximum patients falling in age group 1-10 years of age during their study period [Table-1].

In our study, we encountered a wide spectrum of cases, of which majority of infections were involving Respiratory tract (44%) followed by Bloodstream infections (15%) and Urinary tract (14%). There were considerable number of patients with Skin and soft tissue and Gastrointestinal infections (12% each). Similar findings were reported by Rajeswari et al [8] and Jain H et al[9] where Respiratory system was the commonest system involved (25%).

We have isolated bacterial pathogen from 51% of cases. Also O'Connor D et al[10] during their study observed similar results- 68% bacterial infections, 20% fungal, and 12% viral. Bacteria were the most common causative organisms in study.

As revealed by other studies, Gram negative organisms were involved in majority of infections and staphylococcus has been playing an increasingly important role, we have observed 51% of culture proven bacterial infections with predominant Gram negative ones [6,7,8,9,11]. O'Connor D et al[10] too found that Gram-negative bacteremias most frequently implicated in Infection Related Mortality. Kuo FC et al [12] observed that (91.5%) GNB BSIs occurred in association with severe neutropenia.

The most common frequent bacteria detected in our study were *Pseudomonas* (31.6%) and *Staph aureus* (31.6%). It is therefore imperative that antibiotics used in the treatment and prophylaxis of infections in pediatric ALL have adequate efficacy against Pseudomonal species and other Gram-negative bacteria. However, the use of antibiotic prophylaxis to reduce IRM (Infections Related Mortality) needs to be weighed up against the potential to increase antibiotic resistance. (Table-2)

Several studies including the one by Wang SM et al,(13) have indicated that fungal infections are increasing in frequency, not only in leukemic but in other patients with compromised host defense mechanism.

Our analysis demonstrated 7% mortality rate and all of them occurred during initial phases of chemotherapy (42.9% during induction and 57.1% during interim maintenance) and periods of neutropenia, which is comparable to results of other studies [11,57] Thus, increased awareness of the potential for septic complications is required when caring for patients during these high-risk periods.

We have found infection in 7 cases of Death. (Table-3) The statistical analysis showed that site of infection is significantly affects the outcome (P=0.003). Out of

all deaths 71.4% were attributed to bloodstream infections (MDI and CDI) and 28.6% to respiratory infections. 42.8% cases were of microbiologically identified infections while in remaining 57.2%, the

organisms could not be isolated and they were considered bloodstream infections as per clinical findings.

Table 1: Distribution of the patients according to age (Years) (n=100)

Age Group	Count	Percentage
0-5 years	45	45.00%
5.1-10 years	47	47.00%
10.1-18 years	8	8.00%
Total	100	100%
Mean ± SD	5.67± 3.07	

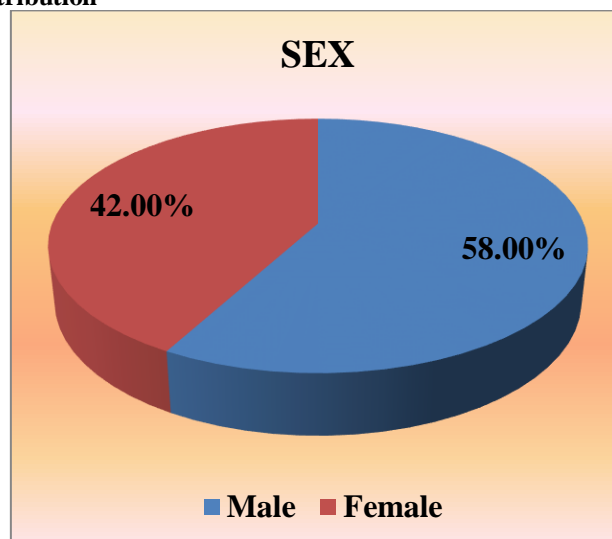
Table 2: Organism isolated from various samples

Cultures		Count	Percentage
BLOOD CULTURE (100)	Sterile	81	81.00%
	<i>Staph aureus</i>	6	6.00%
	<i>Pseudomonas</i>	6	6.00%
	<i>CONS</i>	2	2.00%
	<i>Klebsiella</i>	2	2.00%
	<i>E.coli</i>	2	2.00%
	<i>Proteus</i>	1	1.00%
URINE CULTURE (11)	<i>E.coli</i>	6	54.5%
	<i>Pseudomonas</i>	1	9.1%
	<i>Proteus</i>	1	9.1%
	Sterile	3	27.3%
PUS CULTURE (5)	Sterile	3	60%
	<i>Staph aureus</i>	2	40%
CENTRAL LINE TIP CULTURE (1)	<i>CONS</i>	1	100%

Table 3: Outcome of Infection episode (n = 100)

Outcome	Count	Percentage
Death	7	7.00%
Discharged	93	93.00%

Image-1 Gender wise distribution



CONCLUSION

In conclusion, BSIs of pediatric acute leukemic patients remain severe infections and complications. The risk factors associated with BSIs were GNB

pathogens and neutropenic fever. However, the case-fatality rate was still high under broad spectrum antimicrobial therapy. Early identification of BSIs and

implementation of empiric antibiotics is essential in managing leukemic patients with neutropenic fever.

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