

ACUTE LEUKEMIA IN CHILDREN - AN INPATIENT DESCRIPTIVE STUDY

AHMAD A¹, SALAHUDDIN A², AHMAD S¹

1. Pediatrics Department HMC/ KGMC, Peshawar, Pakistan
2. Pediatrics Department, Peshawar General Hospital Peshawar Pakistan

*Corresponding author email address: samreenahmad1972@gmail.com

(Received, 15th April 2023, Revised 7th October 2023, Published 9th October 2023)

Abstract Acute leukemia in children causes unacceptably high morbidity and mortality in the affected patients in our population. This study was undertaken to create local data that could be used to better understand the characteristics of this disease in our set up, provide better management to the affected children and help decrease the high morbidity and mortality associated with this disease. To determine the frequency of the significant classes of acute leukemia, its subclasses and rate of remission in our study population. This study was conducted in Pediatric B Unit, Department of Pediatrics, Hayatabad Medical Complex, Peshawar, from 1st June 2017 to 31st December 2018. Using consecutive sampling technique, 90 cases were selected. All children who underwent bone marrow examination during the study period in this hospital were included in the study. Data on age, gender, indications, and major types and subclasses of leukemia was extracted from bone marrow record forms of these children and analyzed using SPSS version 20. Means and standard deviations were calculated for age and frequency and percentages for gender, types, and subtypes of leukemia and remission. 90 patients were included in this study. TLC was low in 33 (36.7%). Normal in 24 (26.6%) and raised in 33(36.7%). Acute lymphoblastic leukemia- ALL -L1 accounted for 80 (88.9%) of cases, while acute myelogenous leukemia for 10(11.1%). Acute myelogenous leukemia subtypes included AML-M5 in 5 (5.6%), AML-M2 and AML-M3 (2.2%) AML-M0 2 (2.2%), and AML-M2 1 (1.1%). 43 (47.8%) were newly diagnosed cases. 47 (52.2%) were previously diagnosed cases, of which 26 (55.3%) were in remission. Acute lymphoblastic leukemia ALL-L1 was the commonest type of leukemia with ALL-L1 subtype in all patients followed by acute myelogenous leukemia with AML-M5 the commonest subtype. Rate of response to therapy was 55.3%. antibiotics.

Keywords: Acute leukemia, acute lymphoblastic leukemia, acute myelogenous leukemia, response to therapy, children

Introduction

Acute leukemia results from a series of mutational events in white cell precursors in the bone marrow that occur during the complex hematopoiesis process (Hamadi et al., 2022). Several studies of hematological disorders in children show that leukemia is a significant problem in children (Gul, Ahmad, Jan, Liaqat, & Khan, 2014; Hussain, Khattak, & Bano, 2005; Jan, Zahid, Ahmad, & Gul, 2013; KHALID, FATEEN, & KHAN). Acute lymphoblastic leukemia and acute myelogenous leukemia are the common hematological malignancies in pediatric age group (Arora & Arora, 2016; Bajwa et al., 2017). The incidence of pediatric malignancies is rising globally, with leukemia showing the highest trend (Bajwa et al., 2017; Shah & Coleman, 2007). Childhood leukemia is one of the common malignancies in the pediatric population in Pakistan and globally, but local data on childhood leukemia is scarce.¹¹ This study was undertaken to

generate local data on acute leukemia in children in our setup.

Objectives

To determine the frequency of the major classes of acute leukemia, its subclasses, and rate of remission in our study population.

Place and Duration

This study was conducted in Pediatric A Unit, Department of Pediatrics, Hayatabad Medical Complex, Peshawar, from 1st June 2017 to 31st December 2018

Study Design

Descriptive cross-sectional study

Material and Methods

Using consecutive sampling techniques a total of 90 cases were selected. All children who underwent bone marrow examination during the study period in this hospital were included in the study. Data on age, gender, indications, and major types and subclasses of leukemia was extracted from bone marrow record

forms of these children and analyzed using SPSS version 20. Means and standard deviations were calculated for age and frequency and percentages for gender, types and subtypes of leukemia and remission. Results were presented in tables.

Results

90 patients were included in this study. Mean age was 8.63 (SD±5.104) with a range of 1-18years. 52 (57.8%) were males, and 38 (42.2%) were females (Table1). Indications for bone marrow examination included atypical cells 38 (42.2%), bicytopenia 21 (23.2%), anemia 13 (14.4%), pancytopenia 12 (13.3%), and marked leukocytosis 6(6.7%) (Table 2). TLC was low in 33 (36.7%). normal in 24 (26.6%) and raised in 33(36.7%) (Table 3). Acute lymphoblastic leukemia- ALL -L1 accounted for 80 (88.9%) of cases, while acute myelogenous leukemia for 10(11.1%). Acute myelogenous leukemia subtypes included AML-M5 in 5 (5.6%), AML-M2 and AML-M3 (2.2%) and AML-M0 2 (2.2%), and AML-M2 1 (1.1%). 43 (47.8%) were newly diagnosed cases (Table 4). 47 (52.2%) were previously diagnosed cases, of which 26 (55.3%) were in remission.

Table 1. Gender Distribution

Gender	Frequency	Percentage
Male	52	57.8%
Female	38	42.2%
Total	90	100.0%

Table 2. Indications For Bone Marrow Biopsy

Indication	Frequency	Percentage
Atypical Cells on Smear	38	42.2%
Bicytopenia	21	23.2%
Anemia	13	14.4%
Pancytopenia	12	12.3%
Markedly Raised leukocyte count	6	6.7%
Total	90	100%

Table 3. Total Leukocyte Count

Total Leukocyte Count	Frequency	Percentage
Raised	33	36.7%
Reduced	33	36.7%
Normal	24	26.6%
Total	90	100.0%

Table 4. Diagnostic Categories

Diagnostic Category	Frequency	Percentage
Acute Lymphoblastic Leukemia (ALL-L1)	80	88.9%
Acute Myelogenous Leukemia (AML)	10	11.1%
AML-M5	5	5.6%
AML-M2	2	2.2%
AML-M3	2	2.2%

M3 AML-M0	1	1.1%
AML-M2 Total	90	100.0%

Discussion

In our study cohort, the male-to-female ratio was 1.3:1.0. The commonest type of leukemia was acute lymphoblastic leukemia, accounting for 80 (88.9%) cases, all cases were of ALL-L1 subtype.

Other authors reported acute lymphoblastic leukemia in 92% of cases presented with ALL-L1 as the predominant type, documenting 44 cases of ALL-L1, 2 cases of ALL- L2, and no cases of ALL L3 in a sample of 50 patients (Afridi, Amir, Munir, & Rehman, 2018). One study documented ALL in 74.73% of 210 patients with Pre B- ALL 161 (76.92%) children and T-Cell ALL in 49 (23.08%) (S. Khan, Mir, Khattak, Rehman, & Zeb, 2017). Mushtaq and colleagues reported B cell leukemia in 87% and T cell ALL in 13% of their patients (Mushtaq, Fadoo, & Naqvi, 2013).

In this study, acute myelogenous leukemia was found in 10 (11.1%) with subtypes including AML-M5 (5.6%), AML-M2 and AML-M3 (2.2%), AML-M0 2 (2.2%) and AML-M2 (1.1%) (Table 4). Others have reported AML in 8% with 2 cases each of AML- M2 and AML-M4. (Afridi et al., 2018)Khan and colleagues reported AML 22.06% of their patients AML-M0 4.83%, AML-M2 50%, AML-M3 19.30%, AML-M4 8.06%, AML-M5 12.90%, AML-M6 4.86%.¹² Khalid documented AML in 9.7% of study subjects with AML-M11.3%, AML-M2 0.2%, AML-M32.3%, AML-M4 3.6%, AML-M5 0.7%, AML-M6 1.0%, and AML-M7 0.6%. These differences most likely represent the heterogeneous nature of leukemia at the molecular and genetic level and host-related and environmental variations in different localities. We observed a remission rate of 55.3% in our patients. Khan and colleagues analyzed the response to induction therapy in various subtypes of acute leukemia in children. They concluded that the rate of complete remission is lower and rate of complications is higher in our setup (M. I. Khan, Khan, Rahman, & Yasmeen, 2018). In the developed world, most centers have remission in over 90% of the children (Hunger & Mullighan, 2015). These poor indicators seem to be linked to poor quality of care available to such patients, which may be caused by lack of optimal diagnostic facilities and access to risk-directed therapies and poor quality of supportive treatments. The solution to these problems lies in greater awareness and rational thinking for the health care personnel as well as the community, which will result in early diagnosis and timely initiation of effective management to reduce morbidity and mortality in these patients (Wood & Lee, 2011).

Conclusions

[Citation Ahmad, A., Salahuddin, A., Ahmad, S. (2023). Acute leukemia in children - an inpatient descriptive study. *Biol. Clin. Sci. Res. J.*, 2023: 451. doi: <https://doi.org/10.54112/bsrj.v2023i1.451>]

Acute lymphoblastic leukemia was the commonest type of leukemia with ALL-L1 subtype in all patients followed by acute myelogenous leukemia with AML-M5 the commonest subtype. Rate of response to therapy was quite low.

Conflict of Interest

The authors have declared no conflict of interest

References

- Afridi, J. M., Amir, S., Munir, A., & Rehman, Y. (2018). Types and subtypes of leukaemia in newly diagnosed patients admitted in the department of child health in a tertiary care hospital. *Journal of Medical Sciences*, 26(2), 99-101.
- Arora, R. S., & Arora, B. (2016). Acute leukemia in children: A review of the current Indian data. *South Asian journal of cancer*, 5(03), 155-160.
- Bajwa, M., Tahir, A., Manzoor, I., Khan, S., Bakkar, M., Mubashir, M., . . . FAIZAN, M. (2017). Epidemiological distribution of pediatric oncology in Lahore, Pakistan. *Biomedica*, 33(4), 291.
- Gul, Z., Ahmad, S., Jan, A. Z., Liaqat, F., & Khan, G. A. (2014). SPECTRUM OF HEMATOLOGICAL DISEASES IN CHILDREN PRESENTING WITH ANEMIA BASED ON BONE MARROW EXAMINATION. *Gomal Journal of Medical Sciences*, 12(2).
- Hamadi, R., Assaad, M., Zurndorfer, J., El Gharib, K., Kwok, R., Dhar, M., & Schwab, A. (2022). Intraparenchymal Hemorrhage: A Fatal Presentation of Undiagnosed Acute Myelogenous Leukemia. *Cureus*, 14(6).
- Hunger, S. P., & Mullighan, C. G. (2015). Acute lymphoblastic leukemia in children. *New England Journal of Medicine*, 373(16), 1541-1552.
- Hussain, M., Khattak, T. A. K., & Bano, Q. (2005). Spectrum of hematological disorders in children observed in 424 consecutive bone marrow aspirations/biopsies. *Pak J Med Sci*, 21, 433-436.
- Jan, A. Z., Zahid, B., Ahmad, S., & Gul, Z. (2013). Pancytopenia in children: A 6-year spectrum of patients admitted to Pediatric Department of Rehman Medical Institute, Peshawar. *Pakistan Journal of Medical Sciences*, 29(5), 1153.
- KHALID, A., FATEEN, T., & KHAN, A. A. Frequency of Hematological Disorders in Children Diagnosed on Bone Marrow Examination.
- Khan, M. I., Khan, S. A., Rahman, S. U., & Yasmeen, N. (2018). Response of induction therapy in different immunological subtypes of acute lymphoblastic leukemia in children. *Journal of Medical Sciences*, 26(1), 28-32.

- Khan, S., Mir, A., Khattak, B., Rehman, A., & Zeb, A. (2017). Childhood Leukemias in Khyber Pakhtunkhwa and Afghan Children Visiting to Hayatabad Medical Complex Hospital. *Arch Can Res*, 5(3), 149.
- Mushtaq, N., Fadoo, Z., & Naqvi, A. (2013). Childhood acute lymphoblastic leukaemia: Experience from a single tertiary care facility of Pakistan. *Journal of Pakistan Medical Association*, 63(11), 1399.
- Shah, A., & Coleman, M. (2007). Increasing incidence of childhood leukaemia: a controversy re-examined. *British Journal of Cancer*, 97(7), 1009-1012.
- Wood, W. A., & Lee, S. J. (2011). Malignant hematologic diseases in adolescents and young adults. *Blood, The Journal of the American Society of Hematology*, 117(22), 5803-5815.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Funding

Not applicable

Conflict of Interest

Regarding conflicts of interest, the authors state that their research was carried out independently without any affiliations or financial ties that could raise concerns about biases.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2023