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Pattern and Proportion of acute lymphoblastic leukemia among Children under five years attending the Oncology center at Merowe Medical City, Northern State, Sudan 2024-2026

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Chapter one:

1.Introduction:

1.1. Background:

Acute lymphoblastic leukemia is malignant disease of the bone marrow in which early lymphoid precursors proliferate and replace the normal cells of the marrow ,which disease progresses rapidly and make immature blood cells ,rather than mature cells (1).

ALL is characterized by non-specific symptoms such as persistent fever, pallor, unexplained bruising, and bone pain. Physical findings often include hepatosplenomegaly and lymphadenopathy (2). Definitive diagnosis requires bone marrow aspiration or biopsy, supported by CBC results and, where available, immunophenotyping and genetic analysis for risk stratification . Due to its high prevalence, early clinical identification is crucial for effective management and improved prognosis.

Globally, ALL is the most common childhood leukemia, accounting for approximately 25- 30% of all pediatric cancers. While survival exceeds ~80% in developed countries(3).

The prevalence of acute lymphoblastic leukemia (ALL) among African children under 5 years is lower compared to high-income countries, in sub-Saharan Africa ALL with a low prevalence among children less than 5 years, as indicated by a study of 33 children where 79% were over 5 years old,(4) with an absence of the typical peak incidence in the first five years of life, as observed in a study of 86 patients.

In Sudan, limited data are available regarding the epidemiological and clinical patterns of ALL among children under five years of age.

outcomes remain poor in developing regions due to limited diagnostic procedures and insufficient epidemiological data, and there is limited local data regarding its prevalence among children(5).

Understanding the pattern and proportion of Acute Lymphoblastic Leukemia (ALL) is important for describing the age and sex distribution of affected children, evaluating treatment outcomes, and estimating the burden of the disease. The findings of this study may assist healthcare providers and decision-makers in planning pediatric oncology services, improving resource allocation, and developing appropriate strategies for disease management and control(6).

1.2. Problem Statement:

Every child with Acute Lymphoblastic Leukemia (ALL) should be diagnosed early and managed according to standardized treatment protocols. Achieving this requires reliable local epidemiological data to support healthcare planning and improve patient outcomes. Although efforts have been made to improve childhood ALL through better diagnostic methods, standardized treatment protocols, and enhanced pediatric oncology services, many low- and middle-income countries, including Sudan, still face challenges such as limited epidemiological data, delayed diagnosis, inadequate access to specialized care, and insufficient cancer registries. These gaps highlight the need for local studies to provide evidence that can improve pediatric oncology services and healthcare planning.

1.3. Justification:

Outcomes will provide updated local data that help will guide future research, improve early detection, serve as a baseline for planning educational interventions, and strengthen the quality of the healthcare system.

1.4. Research question:

What is the Pattern and proportion of acute lymphoblastic leukemia among Children under five years attending the Oncology center at Merowe Medical City, and what are the demographic characteristics of these patients?

Hypothesis

Null Hypothesis (H):

There is no significant distribution pattern of Acute Lymphoblastic Leukemia among children under five years attending the Oncology Center at Merowe City.

Alternative Hypothesis (H):

There is a significant distribution pattern of Acute Lymphoblastic Leukemia among children under five years attending the Oncology Center at Merowe City.

1.5.1 General objectives:

To assess the pattern and proportion of acute lymphoblastic leukemia among Children under five years.

1.5.2 Specific Objectives:

1- To estimate the proportion of Acute Lymphoblastic Leukemia cases among pediatrics under 5years

2- To describe the demographic characteristics of children under five diagnosed with Acute Lymphoblastic Leukemia.

3- To determine the subtypes of ALL among the study population

Chapter three:

Methods and tools

3.1. Study Design:

A hospital-based Retrospective descriptive cross-sectional study

3.2. Study Area:

This study will be conducted at the Merowe Social Insurance Oncology Center, part of Merowe Medical City, located in Merowe Locality, Northern State, Sudan. Merowe Medical City was established in 2007 on an area exceeding 100,000 square meters and has been operating under the Social Insurance Investment Authority since 2016. It includes Merowe Social Insurance Hospital (250-bed capacity) and the Oncology Center (100-bed capacity), equipped with modern medical facilities.

The Oncology Center is one of the main referral centers for cancer care in Northern Sudan, receiving patients from Merowe and neighboring states. It is receives approximately 100–150 patients per day, including both new and follow-up cases from Merowe and neighboring states. During the recent conflict in Sudan, it played an important role in maintaining oncology services for patients from different regions. Therefore, it provides a suitable setting for this retrospective hospital-based study conducted from January 2024 to January 2026.

3.3. Study Population:

The study population include

ALL pediatric patients

Inclusion Criteria

1- Children aged under five years.

2- Patients diagnosed with acute lymphoblastic leukemia (ALL).

3- Patients treated or followed up at Merowe Oncology Center during the study period.

4-Medical records containing sufficient clinical and laboratory data relevant to the study.

Exclusion Criteria

1- Patients diagnosed with leukemias other than acute lymphoblastic leukemia.

2- Incomplete or missing medical records.

3- Patients diagnosed outside the study period.

3.4. Sample Size and Sampling Techniques:

Total coverage (census) sampling technique will be used to include all medical records of children under five years diagnosed with acute lymphoblastic leukemia during the study period, due to the small and finite number of cases , total coverage deemed appropriate.

3.5 Data Collection Technique/ Tool :

Data collection will be conducted through a retrospective review of medical records of children under five years diagnosed with Acute Lymphoblastic Leukemia (ALL) at the Oncology Center, Merowe Medical City, during the period from January 2024 to January 2026. Data will be collected using a structured data collection checklist designed specifically for this study.

2.6 Variables:

?? **1. Dependent Variable:**

Pattern and proportion of acute lymphoblastic leukemia (ALL) among children under 5 years

- **2. Independent Variables:**

Clinical Presentation (fever, pallor, bleeding, bone pain)

Laboratory findings

Family history

Place of residence

3. Confounding Variables:

Nutritional status

Presence of infection

4. Background Variables:

Age

Gender

Residence

2.7. Data Analysis:

The collected data will be checked for completeness, coded, entered, and analyzed using the Statistical Package for Social Sciences (SPSS) version 26.

2.8. Ethical Considerations:

Ethical approval will be obtained from the Research Ethics Committee of the Faculty of Medicine, Merowe University of Technology.Permission to conduct the study was obtained from the administration of Merowe Oncology Center, Confidentiality and anonymity of participants' information will be maintained throughout the study, permission will also be sought

from the relevent health authorities.

References:

1. Bertrand Y, Pondere C, Galambrun C. Acute lymphoblastic leukaemia in children. Cancer of the Child. 2008;pp:127-39.

2. Ahmad I, Ghafoor T, Ullah A, Naz S, Tahir M, Ahmed S, Arshad A, Ali A, Khattack TA, Batool F. Pediatric Acute Lymphoblastic Leukemia: Clinical Characteristics, Treatment Outcomes, and Prognostic Factors: 10 Years' Experience From a Low- and Middle-Income Country. JCO Glob Oncol. 2023 Jun;9:e2200288. doi: 10.1200/GO.22.00288. PMID: 37290024; PMCID: PMC10497281.

3. Ding F, Deng L, Xiong J, Cheng Z and Xu J (2025) Analysis of global trends in acute lymphoblastic leukemia in children aged 0– 5 years from 1990 to 2021. Front. Pediatr. 13:1542649. doi: 10.3389/fped.2025.1542649

4. Togo B, Traore F, Doumbia AK, et al. Childhood acute lymphoblastic leukemia in sub Saharan Africa: 4 years' experience at the pediatric oncology unit Bamako, Mali. J Child Adolesc Health. 2018;2(2):24-6.

5. Proceedings of the 103rd Annual Meeting of the American Association for Cancer Research; 2012 Mar 31-Apr 4; Chicago, IL. Philadelphia (PA): AACR; Cancer Res 2012;72(8 Suppl):Abstract nr 5484. doi:1538-7445.AM2012-5484

6. Williams CKO, Foroni L, Luzzatto L, Saliu I, Levine A, Greaves MF. Childhood leukemia and lymphoma: African experience supports a role for environmental factors. Cancer Res. 2012;72(8 Suppl):Abstract 5484. doi:10.1158/1538-7445.AM2012-5484.

Annexes:

Annx 1:

Questionnaire

Section A: Estimate ALL

Age of the child

☐ <1 year

☐ 1–2 years

☐ 3–4 years

Was the child under five years of age at the time of diagnosis?

☐ Yes

☐ No

Was Acute Lymphoblastic Leukemia (ALL) confirmed as the final diagnosis?

☐ Yes

☐ No

Year of diagnosis

☐ 2024☐

☐ 2025☐

☐ 2026☐

Was the medical record complete and eligible for inclusion in the study?

☐ Yes

☐ No

Section B: Demographic Characteristics

Age at diagnosis

☐ <1 year

☐ 1–2 years

☐ 3–4 years

☐ 5 years

Sex

☐ Male

☐ Female

Residence

☐ Merowe

☐ Outside Merowe

Tribe

☐ Ja'alin

☐ Shaigiya

☐ Danagla

☐ Nubian

☐ Other Sudanese tribe

☐ Non-Sudanese

☐ Unknown

Family history of leukemia or cancer

☐ Yes

☐ No

☐ Unknown

Section C: ALL subtypes

Was the subtype of ALL documented in the medical record?

☐ Yes

☐ No

What was the immunophenotypic subtype of ALL?

☐ B-cell Acute Lymphoblastic Leukemia (B-ALL)

☐ T-cell Acute Lymphoblastic Leukemia (T-ALL)

☐ Mixed Phenotype Acute Leukemia (MPAL)

☐ Other (specify): __

How was the subtype confirmed?

☐ Flow cytometry

☐ Immunohistochemistry

☐ Cytogenetic/Molecular analysis

☐ Not documented

Was cytogenetic or molecular analysis performed?

☐ Yes

☐ No

Were cytogenetic or molecular abnormalities documented?

☐ Yes

☐ No

☐ Not documented

Annex 2: Work Plan (Timeline)

Activity	Duration
Proposal writing	1 week
Approval process	1- 2 weeks
Data collection	2-3 weeks
Data analysis	1-2 weeks
Report writing	1 week
Final submission	1 week

Annex 3: Budget

Item	Cost
Printing	_____
Transportation	_____
Stationery	_____
Data ent	_____
Miscellaneous	_____
Total	_____