

Study on the prevalence of leukaemia among individuals aged 1–18 years attending the National Cancer Institute in Misurata, Libya



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ABSTRACT

Introduction: Leukemia is a type of cancer that affects the body's blood-forming tissues, leading to the production of dysfunctional blood cells. Among the various forms of leukemia, two specific types are most commonly found in children aged one month to 18 years. Despite its importance, there is still a lack of localized research on childhood leukemia. This study aimed to assess the prevalence of leukemia in children and adolescents (aged 1–18 years) at the National Cancer Institute in Misurata, Libya, and to evaluate its potential association with age and gender.

Materials and methods: Data were collected retrospectively from the medical records of the Pediatric Oncology Department at the National Cancer Institute (NCI) in Misurata, covering the years 2020 to 2024. The study included 140 pediatric patients (both males and females) aged from one day to 18 years who were diagnosed with leukemia, as classified by the International Classification of Diseases (ICD) for cancer diagnosis and incidence monitoring. The analysis aimed to determine the distribution of leukemia incidence rates and to identify the most prevalent types across different age groups and genders.

Results: 140 cases of leukaemia were documented in this study. The gender distribution showed a higher incidence among males, with 85 cases (60.7%), compared to females, who had 55 cases (39.3%). An age-specific analysis indicated that the highest frequency of diagnoses occurred in the 0–5 years age group, with 61 cases (43.6%). The 5–10 years age group with 49 cases (35%) and the 10–20 years age group with 30 cases (21.4%) followed this. In terms of leukaemia subtypes, acute lymphocytic leukaemia (ALL) was the most common, accounting for 96 cases (68.6%). This was followed by acute myeloid leukaemia (AML), with 29 cases (20.7%). The remaining cases consisted of other types of leukaemia, totalling 15 cases (10.7%).

Conclusion: Acute lymphocytic leukaemia (ALL) is the most common cancer diagnosed in children at the National Cancer Institute. Its incidence is higher in younger age groups and occurs more frequently in males than in females.

Keywords: Acute Lymphoblastic Leukaemia (ALL), Acute Myeloid Leukaemia (AML), childhood cancer, National Cancer Institute.

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Introduction

Acute lymphoblastic leukemia (ALL) is the most common type of leukemia found in children, although it can also affect adults [1]. This condition originates in lymphoid cells and can progress rapidly if not treated [2]. Acute myeloid leukemia (AML) primarily occurs in adults and is characterized by the rapid proliferation of abnormal myeloid cells in the bone marrow. It is less common in children [3].

In a study conducted by the [4] Committee in 2010, it was revealed that acute leukemia constitutes a significant portion of childhood cancers. The research emphasized that early diagnosis and treatment are essential for improving outcomes in children and adolescents.

However, the results for cases of acute myeloid leukemia (AML) were inconsistent, underscoring the necessity for further therapeutic innovations. On the other hand, [5] Carroll explored the risk classification of acute lymphoblastic leukemia (ALL), focusing on genetic alterations, early response criteria, and patient-specific characteristics that influence genetic variation. Although outcomes for pediatric ALL patients have improved significantly, there is still an urgent need for novel treatments, especially for refractory cases.

In Libya, A study conducted by Elmansoury and Shaltout [6] examined the dynamics of inflammatory and immune markers in 105 acute leukemia patients, aged 2 to 88 years, with a mean age of 31. With 49% of patients being male and 51% female.

The study found that blood type significantly influenced basophil counts in 40% of the cohort. The results highlight the considerable impact of acute leukemia on treatment outcomes, revealing specific hematological patterns within the population. Attia [7] conducted a retrospective analysis of childhood cancer cases at the National Cancer Institute (NCI) in Misurata, focusing on the years 2018 and 2019. The study examined 145 pediatric patients aged 0 to 15 years. Out of these, 46 cases were diagnosed as leukemia, representing 31.72% of all cancer cases. In 2018, there were 22 cases of leukemia, which accounted for 28.57% of the total 77 cancer cases reported that year. In 2019, the number of leukemia cases increased to 24, representing 35.29% of the 68 total cancer cases reported. Among the leukemia cases, 41 were classified as acute lymphoblastic leukemia (ALL), making up 89.13% of all leukemia cases, while 5 cases were classified as acute myeloid leukemia (AML), constituting 10.87%. When looking at the distribution of leukemia cases by gender, males accounted for 25 cases, representing 35.54% of all male cancer cases, while females had 21 leukemia cases, which comprised 45.65% of all female cancer cases.

Abushwereb [8] conducted a retrospective study at Tripoli Medical Center (TMC) from 1997 to 2003, analyzing 50 pediatric leukemia cases from the children's oncology department. The research aimed to characterize the prevalence of different types of leukemia and examine correlations with family history, age, and gender, while also evaluating the outcomes of chemotherapy treatments. The findings revealed that Acute Lymphoblastic Leukemia (ALL) and Acute Myeloid Leukemia (AML) collectively accounted for 73% of the cases, with a higher incidence rate observed in male patients compared to females. This study provides valuable baseline data on leukemia epidemiology and treatment responses in Libya's pediatric population during that period.

This study aims to determine the prevalence of leukemia among pediatric patients aged 0 to 18 years at the National Cancer Institute in Misurata, Libya. The investigation consists of two complementary components: an assessment of gender-based distribution (male vs. female) and an analysis of age effects.

Material and Methods

Study design:

A retrospective cross-sectional study was conducted in Misurata, Libya, covering the years 2020 to 2024, utilizing a statistical survey.

Data collection:

Data on the number of paediatric leukaemia patients were obtained from the institutional records of the National Cancer Institute in Misurata. The study collected the following variables: age, sex, and type of leukaemia.

Ethical approval was obtained from the Training and Research Office of the National Cancer Institute in Misurata, ensuring the confidentiality of all personal and medical data, including patient anonymity.

Data analysis:

This study found statistically significant differences ($P \leq 0.01$) among pediatric leukemia patients based on age groups, sex, and leukemia subtypes. A chi-square test (χ^2) was used for the comparative analysis, and all statistical procedures were conducted using SPSS software (version 27).

Results and Discussion

The prevalence rate of leukemia during the study period, categorized by gender

The statistical data collected from the archives of the National Cancer Institute in Misurata (2020–2024) revealed 140 cases of various types of leukemia among children aged 0 to 20 years. The results of this study align with a 2015 study conducted by Yang and Meng in China, which analyzed pediatric leukaemia cases. Their findings indicated that children have a higher risk of developing leukemia compared to other age groups.

The statistical results of this study indicated that between 2020 and 2024, males were more susceptible to leukemia than females, comprising 60.7% and 39.3%, respectively, as shown in Table 1. The findings of the current study support previous research indicating a higher predisposition to childhood leukemia in males. This aligns with the 2016 study by Abushwereb [8] in Libya, which found that males have greater susceptibility, potentially linked to genetic mutations on the Y chromosome. Furthermore, a global trend reported by Amini [9] shows that this gender disparity is not limited to local populations.

Additionally, a chi-square analysis revealed statistically significant differences in incidence rates between genders ($p \leq 0.01$), providing strong evidence for these observations.

Table (1) Gender-Specific Incidence Rates of Leukemia in Pediatric Patients

Gender	Females	Males
Patient infections	55	85
Prevalence rate	%39.30	%60.70

Age groups were categorized the prevalence rate of leukemia during the study period.

Table 2 indicates that the highest disease burden occurred in preschool children (43.6%), followed by school-aged children (35%) and adolescents (21.6%). This suggests possible age-dependent etiological factors.

This study identified children under the age of 5 as the highest-risk group for leukemia, particularly for lymphoblastic subtypes, which accounted for 43.6% of cases. This finding aligns with a study conducted by Emerenciano [10] in Brazil, which reported a peak incidence of leukemia in children under 6 years old. A chi-square analysis confirmed significant differences in incidence rates across different age groups ($\chi^2 = 18.2$, $p \leq 0.01$), reinforcing the observed pattern of age dependence in leukemia incidence.

Table (2) Age-Specific Incidence Rates of Childhood Leukemia

Ages	0-5 years	5-10 years	10-20 years
Patient infections	61	49	30
Prevalence rate	43.60%	35%	21.60%

The prevalence rate of leukemia during the study period, categorized by leukemia type.

Retrospective analysis of pediatric leukemia cases at the National Oncology Institute from 2020 to 2024 revealed that Acute Lymphoblastic Leukemia (ALL) was the most common subtype, comprising 96 cases (68.6%). This was followed by Acute Myeloid Leukemia (AML) with 29 cases (20.76%), and 15 cases (10.76%) were classified as unspecified. The predominance of ALL is consistent with its aggressive nature, as it primarily targets lymphocytes, which allows for rapid proliferation. These findings align with a 2024 study by Attia [7] that examined pediatric patients in Misurata, which reported similar results, indicating ALL as the most frequent subtype. Statistical analysis using the chi-square test demonstrated significant differences ($p \leq 0.01$) in incidence rates among the

leukemia subtypes, highlighting the epidemiological distinctions between ALL, AML, and unspecified forms. The higher prevalence of ALL may reflect biological susceptibility or regional diagnostic trends, suggesting the need for further investigation into the underlying etiological factors.

Table (3) Incidence of Childhood Leukemia by Subtype

Leukemia Subtype	Unspecified	ALL	AML
Patient infections	15	96	29
Prevalence rate	%10.70	68.60%	%20.70

Conclusion

This study highlights the significant prevalence of leukemia, particularly Acute Lymphoblastic Leukemia (ALL), among pediatric patients (aged 1–18 years) at the National Cancer Institute in Misurata, Libya. Key findings indicate a higher incidence in males compared to females, with the age group of 0–5 years being the most affected. The predominance of ALL aligns with global trends, emphasizing its aggressive nature and the need for targeted diagnostic and therapeutic strategies. The observed disparities in gender and age, supported by robust statistical evidence ($p \leq 0.01$), suggest potential biological or environmental risk factors that warrant further investigation. These findings contribute to the limited local data on childhood leukemia and underscore the urgency of enhancing early detection, treatment protocols, and regional research initiatives. Future studies should explore etiological factors, such as genetic predispositions or environmental exposures, to inform preventive measures and improve outcomes for pediatric leukemia patients in Libya.

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