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Original article

Epidemiological Characteristics and Trends of Childhood Cancer in Eastern Libya: A Five-Year Retrospective Study

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Abstract
Cancer is a major global public health challenge and remains one of the leading causes of morbidity and mortality worldwide. It is the second leading cause of death after cardiovascular diseases globally and ranks among the leading causes of death in developing countries. This study aimed to describe the trends and epidemiological characteristics of childhood malignancies in eastern Libya and evaluate cancer type frequency and demographic patterns at Benghazi Children's Hospital. A retrospective cross-sectional descriptive study was conducted using archived data from patients aged 0–16 years diagnosed with childhood cancers at Benghazi Children's Hospital between January 2018 and December 2022. Demographic data, clinical presentations, investigations, tumor types, disease stages, and patient outcomes were collected and analyzed. Among 75,015 hospital admissions, 362 (0.4%) were diagnosed with malignancy. Leukemia was the most common (37.5%), followed by brain tumors (17.4%) and lymphoma (10.4%). Male predominance was observed across all malignancies except brain tumors. The mean age was 6.05 ± 4.21 years, with 47.8% of patients under five years. Other tumors included Wilms' tumor (9.3%), neuroblastoma (6.6%), soft tissue sarcoma (4.9%), bone tumors (4.4%), retinoblastoma (4.1%), carcinoma (1.9%), and hepatoblastoma (0.5%). Common presentations included mass lesions (38.1%), pallor (34.3%), and appetite loss (26.9%). Advanced stages (III–IV) predominated, and 20.9% of patients died during treatment. Childhood cancer cases in eastern Libya increased by 38% over the five-year study period. Leukemia was the predominant malignancy, with most cases originating outside Benghazi. Late-stage presentation remains a significant challenge, highlighting the need for improved early detection and referral systems.
Keywords. Childhood Cancer, Eastern Libya, Epidemiology, Leukemia, Pediatric Oncology, Trends.

Introduction

Cancer is a major global public health challenge and remains one of the leading causes of morbidity and mortality worldwide. It is the second leading cause of death after cardiovascular diseases globally and ranks among the leading causes of death in developing countries [1–3]. Although childhood cancers account for only a small proportion of all malignancies, they represent a significant cause of disease-related mortality among children and adolescents. The burden of childhood cancer extends beyond mortality, affecting the physical, psychological, social, and economic well-being of patients and their families. Globally, an estimated 50–200 children per million are diagnosed with cancer each year, resulting in more than 250,000 new cases annually. Improvements in diagnostic techniques, cancer registration systems, and healthcare access have contributed to increasing reported incidence rates over recent decades.

Despite these advances, marked disparities remain between high-income and low- and middle-income countries regarding diagnosis, treatment, and survival [4,5]. Childhood cancer encompasses a diverse group of malignancies that differ considerably from adult cancers in their biology, clinical presentation, and response to treatment. Leukemia is the most common pediatric malignancy worldwide, followed by central nervous system (CNS) tumors and lymphomas. Other important childhood cancers include Wilms' tumor, neuroblastoma, retinoblastoma, hepatoblastoma, and soft tissue sarcomas. The distribution of these malignancies varies across geographical regions owing to differences in genetic susceptibility, environmental exposures, healthcare systems, and cancer registration practices [5,6]. The incidence of childhood cancer has shown a gradual increase in many regions over the past several decades. Studies from North America and Europe have reported annual increases in the incidence of several pediatric malignancies, particularly leukemia and CNS tumors, while improvements in treatment have substantially increased survival rates. Currently, overall survival exceeds 80% in most high-income countries. However, children living in low- and middle-income countries continue to experience considerably poorer outcomes, with survival rates ranging from approximately 15% to 45%. Delayed diagnosis, limited access to specialized care, treatment abandonment, and inadequate healthcare resources remain major barriers to improving outcomes in these settings [1,7,8].

Within the Eastern Mediterranean Region, childhood cancer remains an important public health concern. According to GLOBOCAN 2020 estimates, approximately 23,847 new childhood cancer cases and 10,535 related deaths occurred in the region. Mortality rates remain disproportionately high in lower-income countries, reflecting inequalities in healthcare infrastructure, early diagnosis, and treatment availability. Variations in the quality and completeness of national cancer registries may also contribute to the underestimation of the true disease burden [9]. The etiology of childhood cancer is complex and differs from that of adult malignancies. Most pediatric cancers arise from genetic alterations, including inherited germline mutations and acquired somatic mutations. Environmental factors such as exposure to ionizing radiation, certain pesticides, solvents, and air pollution have also been associated with increased risks for specific childhood malignancies, particularly leukemia. Conversely, maternal folate supplementation and breastfeeding have been reported as potential protective factors [10–14]. Early recognition and accurate diagnosis are essential for improving childhood cancer outcomes. Clinical manifestations are often nonspecific and vary according to tumor type. Leukemia

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commonly presents with pallor, fatigue, fever, bleeding, or recurrent infections, whereas solid tumors frequently present with localized masses, neurological symptoms, or organ-specific manifestations. Diagnosis relies on a combination of clinical evaluation, laboratory investigations, imaging studies, histopathological examination, and bone marrow assessment where appropriate [15,16].

In Libya, information regarding childhood malignancies remains limited. While several studies have described the epidemiology of adult cancers, published data on pediatric cancers are scarce, particularly regarding regional incidence patterns and demographic characteristics. The absence of comprehensive population-based data limits healthcare planning, resource allocation, and the development of evidence-based strategies for pediatric oncology services [17,18]. Therefore, this study aimed to describe the pattern of childhood malignancies diagnosed at Benghazi Children's Hospital, eastern Libya, between 2018 and 2022. Specifically, the study examined the frequency of different cancer types and their demographic characteristics to provide updated epidemiological evidence that may support future clinical practice, healthcare planning, and cancer control strategies in Libya.

Methods

Study Design and Setting

A retrospective cross-sectional descriptive study was conducted at Benghazi Children's Hospital, the only tertiary referral center providing pediatric oncology services in eastern Libya. The study included all eligible pediatric cancer cases diagnosed between January 1, 2018, and December 31, 2022. The hospital's Hematology and Oncology Unit, established in 1983, serves children from Benghazi and the surrounding eastern regions of Libya.

Study Population

The study included all children aged 0–16 years with a confirmed diagnosis of malignant disease who were managed at Benghazi Children's Hospital during the study period. Patients were classified according to cancer type and age group (<5 years, 5–10 years, and 11–16 years).

Data Collection

Data were collected retrospectively from patients' medical records and the hospital statistics department using a structured data collection form. The extracted variables encompassed demographic characteristics, including age, sex, nationality, and place of residence, as well as the date of admission and year of diagnosis. Clinical presentation was documented alongside diagnostic investigations, which included laboratory findings, imaging studies, histopathological examinations, and other relevant diagnostic procedures. Information on cancer type and disease stage was recorded when available. Treatment modalities were systematically captured, and clinical outcomes were assessed at the last follow-up, ensuring a comprehensive dataset for analysis.

Exclusion Criteria

Patients with benign tumors were excluded from the study. Medical records with incomplete information were excluded only from analyses involving the missing variables but were retained in analyses for which complete data were available.

Statistical Analysis

Data were entered, cleaned, and analyzed using the Statistical Package for the Social Sciences (SPSS) version27.0. Descriptive statistics were used to summarize the study variables. Categorical variables were presented as frequencies and percentages. Cross-tabulations were performed to describe the distribution of cancer types according to age group and sex, and figures were used to illustrate the main findings.

Results

Among 75,015 hospital admissions, 362 children (0.4%) were diagnosed with malignancy. Libyan nationals comprised the vast majority of patients (97.3%, n = 354), while non-Libyan patients accounted for 2.7% (n = 10). More than half of the children (55.2%) resided outside Benghazi. Leukemia cases were more frequently from outside Benghazi (63.4%), whereas solid tumors showed an approximately equal distribution between Benghazi and other regions. The patients' ages ranged from birth to 16 years, with a mean age of 6.05 ± 4.21 years. Most cases (80.0%) occurred in children under 10 years of age, including 47.8% who were younger than 5 years, while only 18.7% were older than 10 years (Figure 1).

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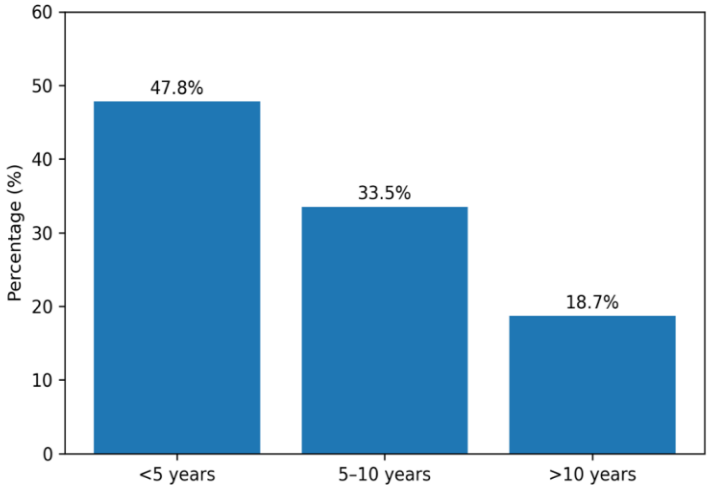

Figure 1. Age distribution of children diagnosed with malignancy

Males constituted 221 cases (61.0%), compared with 141 females (39.0%), yielding an overall male-to-female ratio of 1.5:1 (Figure 2).

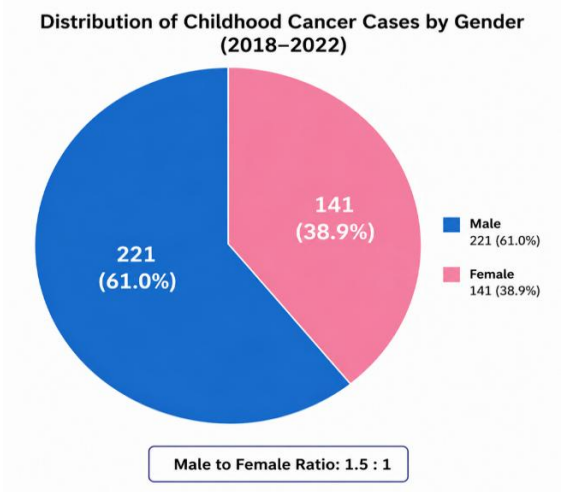

Figure 2. The gender percentage of cancer children in the study (2018-2022)

Leukemia was the most frequent (136 cases, 37.5%), followed by brain tumors (63, 17.4%), lymphoma (38, 10.4%), Wilms' tumor (34, 9.3%), neuroblastoma (24, 6.6%), soft tissue sarcoma (18, 4.9%), bone tumors (16, 4.4%), retinoblastoma (15, 4.1%), carcinoma (7, 1.9%), and hepatoblastoma (2, 0.5%). Nine other cases included histiocytosis (3), teratoma (2), and single cases of pheochromocytoma, connective tissue tumor, histiocytoma, and fibrohistiocytosis (Table 1). This male predominance was observed across most cancer types. However, CNS tumors showed a female predominance, accounting for 55.0% (n = 35) of cases, whereas lymphoma demonstrated the strongest male predominance, with males representing 68.0% of cases (Table 2).

Table 1. Distribution of patients by cancer type

Type	No.	%
Hematological		
Leukemia	136	37.6
Lymphoma	38	10.5
Non-hematological		
CNS tumor	63	17.4
Wilms' tumor	34	9.4
Neuroblastoma	24	6.6
Soft tissue sarcoma	18	4.9
Bone tumor	16	4.4
Retinoblastoma	15	4.1
Carcinoma	7	1.9
Hepatoblastoma	2	0.6
Other tumors	9	2.5

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Table 2. Distribution by cancer type and sex

Cancer type	Male N (%)	Female N (%)	Total
Leukemia	85 (62%)	51 (37%)	136
Lymphoma	26 (68%)	12 (31.5%)	38
Brain tumor	29 (46%)	35 (55%)	64
Wilms' tumor	20 (58.8%)	14 (41.2%)	34
Neuroblastoma	15 (62.5%)	9 (37.5%)	24
Bone tumor	10 (62.5%)	6 (37.5%)	16
Retinoblastoma	9 (60%)	6 (40%)	15

Case numbers rose progressively from 2018 (49 cases) to a peak in 2020 (94 cases), then declined to 72 cases in both 2021 and 2022. The annual percentage change peaked at 53% between 2019–2020, dropped to -22.3% in 2020–2021, and stabilized at 0% in 2021–2022. The five-year average annual percentage change was 32.8% (Figure 3).

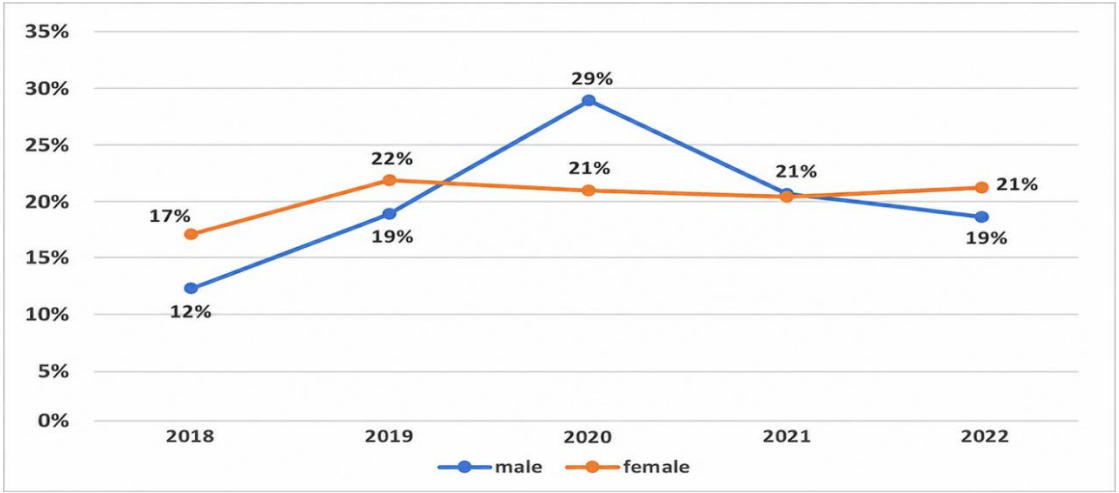

Figure 3. Annual distribution of male and female patients for all cancer types (2018–2022)

The study included 136 patients with leukemia, with ALL being the most common type (79.4%), followed by AML (18.3%), while CML (1.4%) and biphasic cases (0.7%) were rare. Among ALL patients, the highest proportion was observed in the <5 years (43%) and 5–10 years (40%) duration groups, with fewer cases in the >10 years group (17%). AML cases were more evenly distributed across durations, with 40% in <5 years, 36% in 5–10 years, and 24% in >10 years. CML had only two cases with equal distribution between <5 years and >10 years, while the single biphasic case was found in the >10 years group. Overall, 41% of all patients were in the <5 years group, 38% in 5–10 years, and 19% in >10 years (Table 3).

Table 3. Leukemia distribution by age group

Type	<5 years	5–10 years	>10 years	Total
	No (%)	No (%)	No (%)	No (%)
ALL	46 (43%)	44 (40%)	18 (17%)	108 (79.4%)
AML	10 (40%)	9 (36%)	6 (24%)	25 (18.3%)
CML	1 (50%)	0 (0%)	1 (50%)	2 (1.4%)
Biphasic	0 (0%)	0 (0%)	1 (100%)	1 (0.7%)
Total	57 (41%)	53 (38%)	26 (19%)	136 (100%)

Brain tumors ranked second; medulloblastoma was the most common tumor type (28.5%), followed by astrocytoma (19%), while ependymoma and glioma each accounted for 15.8%, and craniopharyngioma was the least frequent (3.2%), with 17.4% classified as other tumor types. Regarding age distribution, the majority of cases occurred in children aged <5 years (49%), followed by 5–10 years (38%), while only 12% were observed in those aged >10 years. Medulloblastoma was most frequent in the 5–10-year group (55%), whereas astrocytoma and ependymoma were more common in children under 5 years. Craniopharyngioma occurred exclusively in the <5 years group (Table 4).

Table 4. CNS tumor distribution by histopathology and age group

Type	<5 years	5–10 years	>10 years	Total
	No (%)	No (%)	No (%)	No (%)
Medulloblastoma	7 (38.8%)	10 (55%)	1 (5.5%)	18 (28.5%)
Astrocytoma	6 (50%)	5 (41.6%)	1 (8.3%)	12 (19%)
Ependymoma	5 (50%)	3 (30%)	2 (20%)	10 (15.8%)

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Glioma	4 (40%)	4 (40%)	2 (20%)	10 (15.8%)
Craniopharyngioma	2 (100%)	0 (0%)	0 (0%)	2 (3.2%)
Others	7 (63%)	2 (18.%)	2 (18.2%)	11 (17.4%)
Total	31 (49%)	24 (38%)	8 (12%)	63 (100%)

The table presents the distribution of lymphoma cases according to histological type and age group among 38 patients. Overall, Hodgkin lymphoma was the most common subtype (68.2%), followed by non-Hodgkin lymphoma and Burkitt's lymphoma, each accounting for approximately 15–16% of cases. In terms of age distribution, the highest proportion of lymphoma cases occurred in patients aged >10 years (47.3%), while the <5 years and 5–10 years groups each contributed 26.3%. Hodgkin lymphoma was most frequently observed in the >10 years group (42.3%), whereas non-Hodgkin lymphoma and Burkitt's lymphoma also showed a predominance in older children, with 66.6% and 50%, respectively, in the >10 years group (Table 5).

Table 5. Lymphoma distribution by type and age group

Type	**<5 years No (%)**	**5–10 years No (%)**	**>10 years No (%)**	**Total No (%)**
Hodgkin lymphoma	8 (30.7%)	7 (26.9%)	11 (42.3%)	26 (68.2%)
Non-Hodgkin lymphoma	1 (16%)	1 (16.6%)	4 (66.6%)	6 (15.7%)
Burkitt's lymphoma	1 (16.6%)	2 (33.3%)	3 (50%)	6 (15.8%)
Total	10 (26.3%)	10 (26.3%)	18 (47.3%)	38 (100%)

The (Table 6) shows the distribution of bone tumors according to histopathological type and age group among 16 patients. Osteosarcoma was the most common bone tumor, accounting for 56.25% of cases, followed by Ewing's sarcoma (37.5%), while other bone tumor types represented 6.25% of cases. Regarding age distribution, bone tumors were predominantly observed among patients older than 10 years (75%), with the remaining 25% occurring in the 5–10 years age group, and no cases were reported in children under 5 years. Osteosarcoma showed a strong predominance in the >10 years group, with 77% of cases occurring in this age category, while Ewing's sarcoma also occurred mainly among patients older than 10 years (66%).

Table 6. Bone tumor distribution by type and age group

Type	**<5 years**	**5–10 years**	**>10 years**	**Total**
	No (%)	No (%)	No (%)	No (%)
Osteosarcoma	0 (0%)	2 (22%)	7 (77%)	9 (56.25%)
Ewing's sarcoma	0 (0%)	2 (33%)	4 (66%)	6 (37.5%)
Others	0 (0%)	0 (0%)	1 (100%)	1 (6.25%)
Total	0 (0%)	4 (25%)	12 (75%)	16 (100%)

The (Table 7) presents the distribution of soft tissue sarcomas according to histopathological type and age group among 18 patients. Rhabdomyosarcoma was the most common subtype, accounting for 72% of cases, followed by liposarcoma and fibrosarcoma, each representing 11%, while myosarcoma was the least frequent type (5.5%). Regarding age distribution, most soft tissue sarcoma cases were observed in the 5–10 years age group (44%), followed by children younger than 5 years (33%), while 22% of cases occurred in patients older than 10 years. Rhabdomyosarcoma was mainly diagnosed among children aged 5–10 years (53%), whereas liposarcoma occurred exclusively in patients older than 10 years. Fibrosarcoma showed an equal distribution between the <5 years and 5–10 years groups, while the single case of myosarcoma was reported in a child younger than 5 years

Table 7. Soft tissue sarcoma distribution by type and age group

Type	**<5 years**	**5–10 years**	**>10 years**	**Total**
	No (%)	**No (%)**	**No (%)**	**No (%)**
Rhabdomyosarcoma	4 (30%)	7 (53%)	2 (15%)	13 (72%)
Liposarcoma	0 (0%)	0 (0%)	2 (100%)	2 (11%)
Fibrosarcoma	1 (50%)	1 (50%)	0 (0%)	2 (11%)
Myosarcoma	1 (100%)	0 (0%)	0 (0%)	1 (5.5%)
Total	6 (33%)	8 (44%)	4 (22%)	18 (100%)

Nasopharyngeal carcinoma was the most common subtype, accounting for 42% of cases among 7 patients, followed by adrenocortical carcinoma (28.8%), while thymic carcinoma and parotid carcinoma each represented 14% of cases. Regarding age distribution, carcinomas were more frequently observed among patients older than 10 years, accounting for 5 cases (71.4%), while 2 cases (28.6%) occurred in children younger than 5 years, and no cases were reported in the 5–10 years age group. Nasopharyngeal, thymic, and parotid carcinomas occurred exclusively in patients older than 10 years, whereas adrenocortical carcinoma was observed only in children under 5 years (Table 8).

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Table 8. Carcinoma distribution by type and age group

Type	<5 years	5–10 years	>10 years	Total
	No	No	No	No (%)
Nasopharyngeal carcinoma	0	0	3	3 (42%)
Adrenocortical carcinoma	2	0	0	2 (28.6%)
Thymic carcinoma	0	0	1	1 (14%)
Parotid carcinoma	0	0	1	1 (14%)
Total	2	0	5	7 (100%)

Wilms' tumor was the most frequent tumor type, with 34 cases, followed by neuroblastoma (24 cases) and retinoblastoma (15 cases). All three tumor types showed a clear predominance among children younger than 5 years. Wilms' tumor occurred mainly in the < 5-year age group (76%), with fewer cases reported among children aged 5–10 years (20%) and >10 years (2.9%). Similarly, neuroblastoma was predominantly diagnosed in children under 5 years (75%), while 25% of cases occurred in the 5–10 years group, with no cases in children older than 10 years. Retinoblastoma showed the highest proportion among children under 5 years (80%), followed by 20% in the 5–10 years group, and no cases beyond 10 years (Table 9).

Table 9. Age distribution of Wilms' tumor, neuroblastoma, and retinoblastoma

Type	<5 years	5–10 years	>10 years	Total
	No (%)	No (%)	No (%)	
Wilms' tumor	26 (76%)	7 (20%)	1 (2.9%)	34
Neuroblastoma	18 (75%)	6 (25%)	0 (0%)	24
Retinoblastoma	12 (80%)	3 (20%)	0 (0%)	15

The most common presenting symptom was the presence of a lump, reported in 139 patients (38.1%), followed by pallor in 125 patients (34.3%). Other frequent symptoms included loss of appetite (26.9%), weight loss (24.5%), and fever (20.6%). Musculoskeletal and gastrointestinal symptoms such as bone pain and vomiting, were each reported in 16.5% of cases, while skin rash and headache accounted for 14.3% and 11.3%, respectively. Less frequently reported symptoms included fatigability (8.8%), bleeding (6.5%), abdominal pain (5.5%), lethargy (3.6%), and decreased activity (1.1%) (Table 10).

Table 10. Distribution of Clinical Presentations Among Pediatric Cancer Patients

Presentation	N (%)
Lump	139 (38.1%)
Pallor	125 (34.3%)
Loss of appetite	98 (26.9%)
Weight loss	89 (24.5%)
Fever	75 (20.6%)
Bone pain	60 (16.5%)
Vomiting	60 (16.5%)
Skin rash	52 (14.3%)
Headache	41 (11.3%)
Fatigability	32 (8.8%)
Bleeding	24 (6.5%)
Abdominal pain	20 (5.5%)
Lethargy	13 (3.6%)
Decreased activity	4 (1.1%)

Among lymphoma cases (n=38), the majority of patients were diagnosed at advanced stages, with Stage IV being the most common (36%), followed by Stage III (31%), while fewer cases were identified at Stage II (26%) and Stage I (5%). For Wilms' tumor (n=34), cases were more evenly distributed across stages, with Stage II and Stage III each accounting for 32.3%, followed by Stage I (23.5%) and Stage IV (11.7%). In neuroblastoma cases (n=24), half of the patients presented with Stage IV disease (50%), followed by Stage III (29.1%), whereas early-stage disease was less frequent, with Stage I and Stage II accounting for 8.3% and 12.5%, respectively (Table 11).

Table 11. Stage Distribution According to Malignancy Type

Type	Stage I (%)	Stage II (%)	Stage III (%)	Stage IV (%)	Total
Lymphoma	2 (5%)	10 (26%)	12 (31%)	14 (36%)	38
Wilms' tumor	8 (23.5%)	11 (32.3%)	11 (32.3%)	4 (11.7%)	34
Neuroblastoma	2 (8.3%)	3 (12.5%)	7 (29.1%)	12 (50%)	24

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Among the 362 patients included, the largest proportion were continuing treatment at the last contact, accounting for 123 patients (33.8%). This was followed by patients who were lost to follow-up (89 patients, 24.5%). A total of 76 patients (20.9%) had died, while 74 patients (20.3%) were off treatment at the time of the last assessment (Table 12).

Table 12. Patient Status at Last Contact

Status	N	%
Continuing treatment	123	33.8%
Lost to follow-up	89	24.5%
Died	76	20.9%
Off treatment	74	20.3%
Total	362	100%

Discussion

Childhood cancer demonstrates marked geographical variation, reflecting both environmental and genetic influences [19]. The distribution of malignancies in this study—leukemia (37.5%), CNS tumors (17.4%), and lymphoma (10.4%)—is consistent with patterns reported in several developed countries, including China, Shanghai, Germany, and Egypt [18,19, 20, 21]. In contrast, studies from Yemen and Nigeria reported lymphoma as the most common childhood malignancy [23–24]. Our findings also differ from an earlier local study (1996–1999), where lymphoma ranked second, suggesting a possible epidemiological shift over time [25].

We observed a 38% increase in childhood cancer cases over the study period, with an average annual percentage change of 32.8%. This rising trend is consistent with reports from Kuwait, Iran, and earlier Libyan data [26,27]. However, the absence of a national cancer registry in eastern Libya limits interpretation, as this increase may reflect improved case ascertainment rather than a true rise in incidence. In contrast, stable or fluctuating trends have been reported in China [22], while Egypt documented a more moderate annual increase [21]. Male predominance (61%, ratio 1.5:1) aligns with global patterns, where male-to-female ratios range between 1.2:1 and 1.6:1 [29–32]. The stronger male bias observed in lymphoma (2:1) is consistent with previous reports showing higher rates of both Hodgkin and non-Hodgkin lymphoma in males [33,34]. Interestingly, the slight female predominance in CNS tumors contrasts with findings from Kuwait, suggesting possible regional biological or environmental differences [27].

The high proportion of cases in children under five years (47.8%) is consistent with international data and reflects the embryonal origin of many pediatric tumors [18,35,36,37]. Similar patterns have been reported in Egypt and earlier local studies [21,25]. In contrast, studies from Yemen and Dakar reported peak incidence in older age groups, highlighting regional variation [23–31]. The peak incidence of ALL at 2–3 years and rarity of lymphoma under five years are consistent with established epidemiology [38, 39]. CNS tumors showed predominance of medulloblastoma, aligning with Iraqi data but differing from other regional studies reporting astrocytoma or glioma as more common [31,26]. Bone tumors were mainly osteosarcoma and Ewing sarcoma, reflecting the known association with adolescent growth spurts [41–43]. Soft tissue sarcomas were dominated by rhabdomyosarcoma in younger children, consistent with Yemeni findings, although some populations show a bimodal age distribution [23,44]. Carcinomas were rare, consistent with the known low incidence of epithelial tumors in childhood [23,45]. Embryonal tumors showed age distributions typical of Wilms' tumor, neuroblastoma, and retinoblastoma [46–47].

The predominance of patients from outside Benghazi (55.2%), particularly for leukemia cases, reflects the hospital's role as a regional referral center, similar to patterns reported in Sudan and Egypt [12, 48]. The observed shift from earlier local data suggests an expanding catchment area or changes in population distribution [29]. The most common presentations—lump, pallor, and appetite loss—differ from other regional studies where fever and pain are more prominent presenting features [30]. Late-stage presentation in a substantial proportion of cases reflects delayed diagnosis and limited awareness, similar to findings from Mexico and other low-resource settings [49]. In contrast, earlier-stage diagnosis reported in Egypt suggests better access to healthcare services [30]. The observed mortality rate (20.9%) and loss to follow-up (24.5%) are comparable to reports from other low-income countries but significantly worse than outcomes in high-income settings such as Kuwait [24,26]. These disparities likely reflect differences in healthcare infrastructure, access to treatment, and socioeconomic barriers, particularly in regions where the majority of childhood cancers occur [50].

Conclusion

This study revealed that leukemia, brain tumors, and lymphoma are the three most prevalent childhood cancers in eastern Libya, consistent with global patterns, though with a higher leukemia proportion (37.5%). Children under five years comprised the largest affected group (47.8%), reflecting the embryonal nature of many pediatric malignancies. Male predominance (1.5:1) was observed across all cancers except brain tumors. Over half of the patients (55.2%) originated from outside Benghazi, confirming the hospital's regional referral role. Alarmingly, most lymphoma, Wilms' tumor, and neuroblastoma cases presented at advanced stages (III–IV), indicating delayed diagnosis—a persistent challenge in low-resource settings. Based on these findings, we recommend establishing a national childhood cancer registry in eastern Libya, implementing public awareness campaigns for early symptom recognition, strengthening diagnostic and treatment

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facilities at Benghazi Children's Hospital, and developing strategies to reduce treatment abandonment and loss to follow-up.

Limitations

As a retrospective study reliant on existing medical records, this investigation faced limitations common in low-resource settings, including incomplete staging data for some tumors and inability to accurately estimate survival rates—which would require prospective cohort follow-up over five years. Establishment of a population-based cancer registry in Benghazi would address these gaps. No external funding was received.

Conflicts of Interest

The authors declare no conflicts of interest.

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