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(RESEARCH ARTICLE)

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Pediatric Lymphoma Incidence at Children's Hospital Benghazi from 2014 to 2023

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Abstract

Background: Malignant lymphoma is caused by the neoplastic growth of lymphocytes and can manifest itself diffusely or in one or more lymph node. Hodgkin lymphoma and non-Hodgkin lymphoma commonly arise from lymphoid tissue. Hodgkin lymphoma is rare B-cell malignant neoplasm it is mainly divided into two main subtype: classical Hodgkin lymphoma and nodular lymphocyte-predominant Hodgkin Lymphoma. Non-Hodgkin lymphoma is malignant disorder arising from cell of the immune system and typically present as lymphadenopathy or solid tumor.

Objective: Aim of this research is detection of Pediatric lymphoma prevalence and the most common group affected in both age and gender in Children's Hospital - Benghazi.

Methods: Cross sectional study was conducted on 59 cases of pediatric lymphoma. The cases were admitted to Children's Hospital - Benghazi. within the time period from January 2014 to May 2023. Data were distributed on the basis of age, gender, year of diagnosis, histological type, and others.

Result: The highest number recorded was 9 cases in the years 2017, 2019 and 2020 and the lowest number of cases were at the year 2018 with only 2 cases. The average age of the cases found in the archive was 7.7 year of age. The gender distribution was 41 males, in comparison with only 18 females. The most common type of lymphoma would be Hodgkin lymphoma with 34 cases, histological reports showed the most common subtype of Non-Hodgkin lymphoma was Burkitt lymphoma with 9 cases.

Conclusion: Pediatric lymphoma in Children's Hospital Benghazi had a clinical presentation in favor of Hodgkin lymphoma .in this research it was detected the distribution of males was more predominant than females. Most cases found were at 3-4 years of age. medical records showed Stage 3 was the most common stage of the tumor.

Keywords: Hodgkin lymphoma; Pediatric Lymphoma; Children's Hospital; Benghazi

1. Introduction

The lymphatic system plays a critical role in therapeutic contexts, particularly due to its significance as a pathway for cancer metastasis. Inflammation of lymphatic vessels and nodes serves as a key indicator of pathology [1]. Lymphoid tumors, including those in the liver, spleen, bone marrow, and peripheral blood, have the potential to spread to various tissues. Diagnosis of lymphoid neoplasms relies on the morphological and molecular properties of tumor cells due to

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their similar clinical behavior [2]. Hodgkin lymphoma and non-Hodgkin lymphoma commonly originate from lymphoid tissues [3]. Hodgkin lymphoma, a rare B-cell malignant neoplasm, is primarily divided into Classical Hodgkin lymphoma and Nodular lymphocyte-predominant Hodgkin lymphoma [4]. Although the exact cause remains unknown, factors such as viral infections, genetic predisposition, and immunosuppression are associated with an increased risk [5].

Non-Hodgkin lymphomas (NHL) are malignant disorders arising from immune system cells, often presenting as lymphadenopathy or solid tumors [6]. NHL can be classified as low grade (indolent) or high grade (aggressive), influencing the disease's natural course and management [7]. Hodgkin lymphoma is highly treatable in both children and adults, with ongoing progress in clinical trials within pediatric HL study groups. However, pediatric HL survivors face a significant risk of developing life-threatening second malignancies [8].

NHL is the fourth most common tumor in children, with differences in staging, histologic subtypes, treatments, and outcomes compared to adults. While over 90% of pediatric NHL cases exhibit high-grade histology, adults typically present with low or intermediate grade NHL [9-10].

Studies in different regions, including Tunisia, Egypt, and Libya, emphasize the prevalence of Burkitt lymphoma among childhood non-Hodgkin lymphomas. Data reveal variations in incidence rates, age of diagnosis, and gender distribution [11-13].

1.1. Rationale and knowledge gap

This manuscript fills a small gap in the literature about the Prevalence of Pediatric Lymphoma in Children's Hospital - Benghazi Between the Years (2014-2023).

Objective:

The aim of this research is detection of Pediatric lymphoma prevalence and the most common group affected in both age and gender in Children's Hospital Benghazi.

This manuscript is written following xxx checklist (if applicable).

2. Material and Methods

A cross-sectional analysis was conducted on 59 cases of pediatric lymphoma admitted to Children's Hospital Benghazi between January 2014 and May 2023. Data were systematically collected from the Department of Hematology and Immunology staff files, encompassing key variables such as file number, age, gender, year of diagnosis, nationality, residence, lymphoma types, subtypes, stage, complications, histopathological and cytological reports, as well as blood test results. Pediatric lymphomas were histopathologically classified into Burkitt lymphoma, classical type, diffuse large B-cell lymphoma, and other subtypes.

3. Results

In total, 59 patients were diagnosed with pediatric lymphoma in the children's hospital of Benghazi in the studied period.

The highest number recorded in one year was nine cases in the years 2017 and 2019, followed by seven in 2017, five cases in 2015 and 2021, with the lowest number of cases recorded in the year of 2018 at just two cases. (Figure 1).

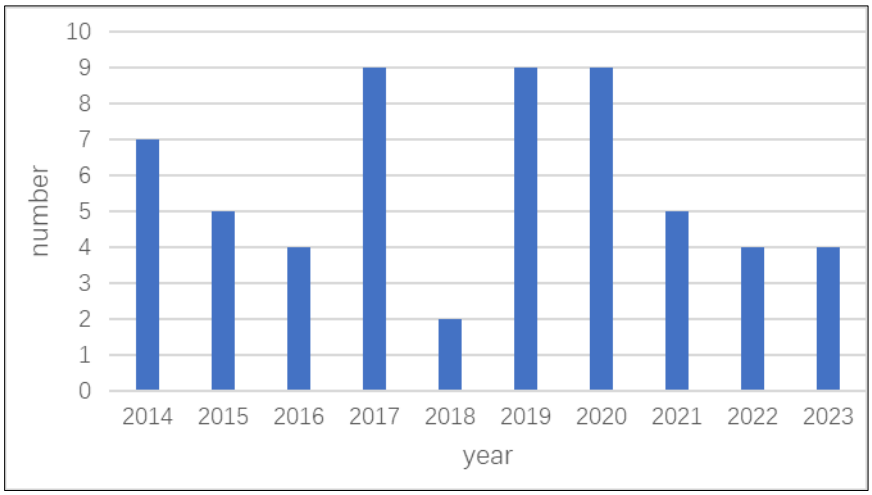

Figure 1 The number of cases each year found in the archive of the Children's Hospital Benghazi

Twenty -five patients (45.5%) were from Benghazi, nine from Abayda (16.4%), seven from Tobrik (12.7%), three from Ajdabiya (5.5%), two from Al-Kofra (3.6%), and the rest from other residences as shown in Table 1. and Figure 2. Most patients were Libyan nationality (93.1%), while two cases (3.4%) were Egyptian and only one Palestine and one Syrian (91.7% each) (Figure 3).

Table 1 Geographical distribution of Pediatric lymphoma patients per city

From	Number	%
Benghazi	25	45.45
Albayda	9	16.36
Tobruk	7	12.73
Ajdabiya	3	5.45
Kufra	2	3.64
Al-abyer	1	1.82
Almarj	1	1.82
Bashar	1	1.82
Derna	1	1.82
Deryana	1	1.82
Ghat	1	1.82
Sabha	1	1.82
Shahat	1	1.82
Solok	1	1.82
Total	55	100.00

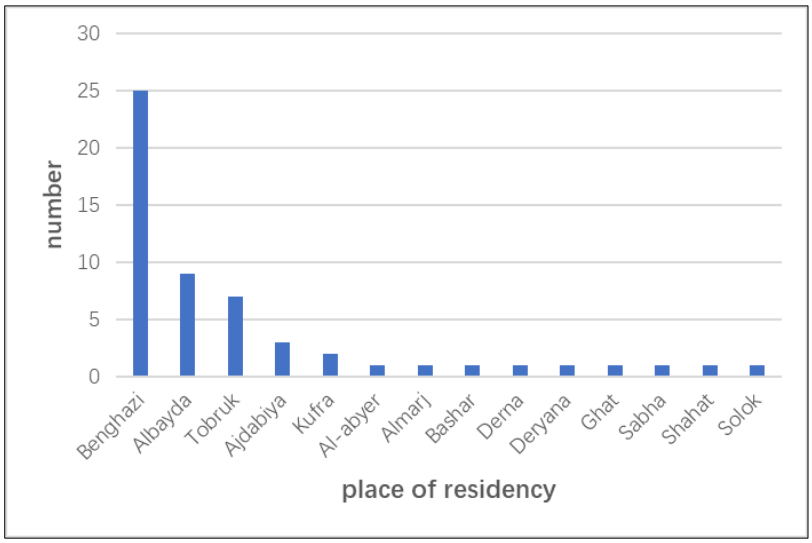

Figure 2 Geographical distribution of Pediatric lymphoma patients per city

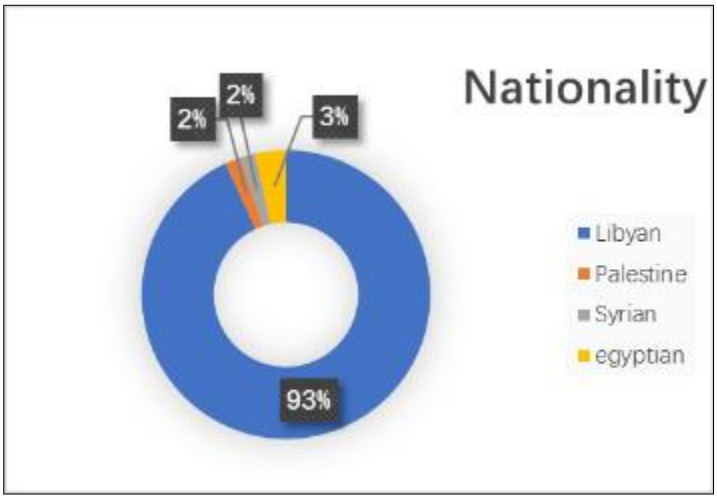

Figure 3 The patient's nationality

The average age of the cases found in the archive was 7.7 years of age, with them ranging from two years to fourteen. Older cases would of course not be present at a pediatric facility.

Most cases were found at 3-4 years of age namely twelve cases followed by the ages 7-8, and ages 13-14 years of age with eleven patients recorded each.

The least amount of cases was found between the ages of five and six years with five cases. The whole distribution can be seen in figure 4.

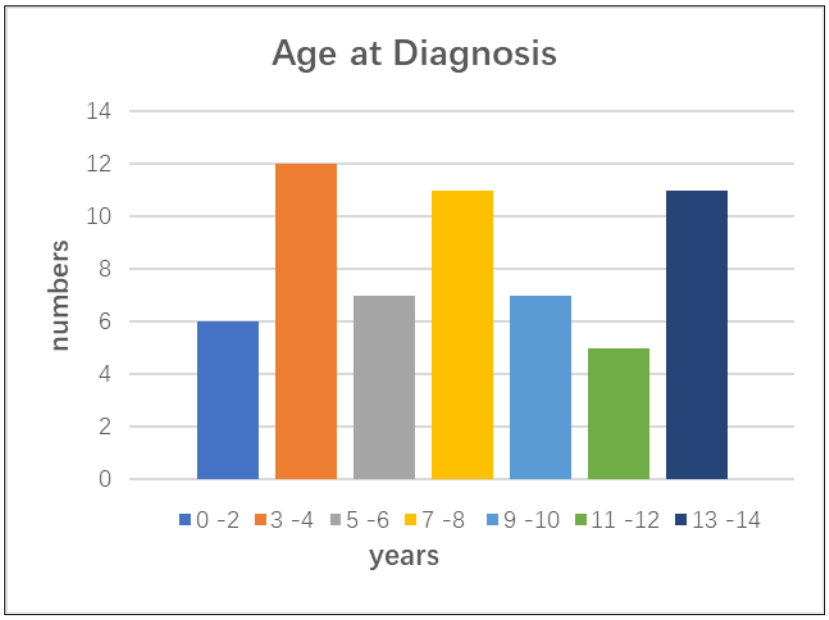

Figure 4 Distribution of patients according to age groups

In terms of gender distribution, of the 59 cases, 41 were male (69.5%), with the females only being 18 (30.5%). This is shown in a pie chart in figure 5.

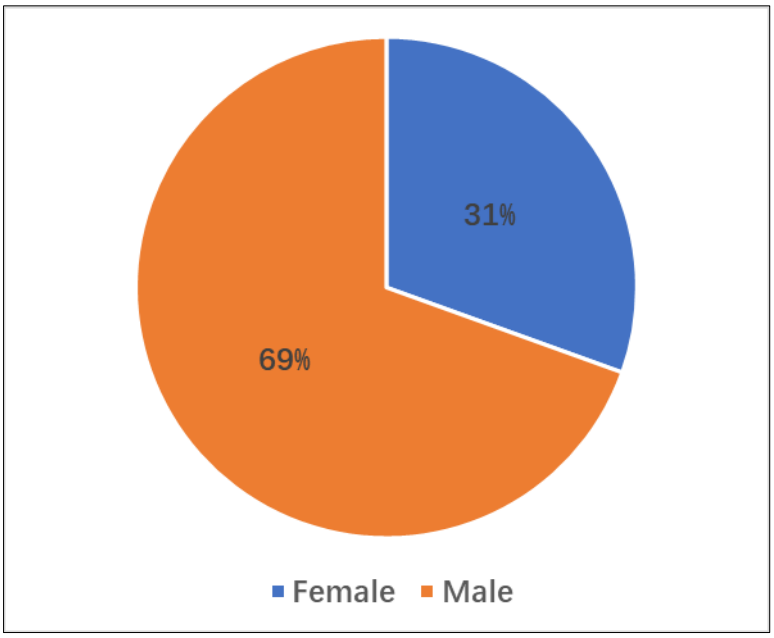

Figure 5 Pie chart of the gender distribution of the incidences

With the regard to pathology, the most common type recorded was Hodgkin lymphoma with 34 cases (59.7%), with non-Hodgkin lymphomas making up 22 cases (38.6%) with one recorded as just Lymphoma (Figure 6).

Histopathological reports showed the most common type of non-Hodgkin lymphoma to be Burkitt lymphoma with nine cases (45%), followed by classic type and Diffuse Large B-Cell Lymphoma with two patients each (10%), with the rest having one case each (5%), those being anaplastic large cell lymphoma, follicular non-Hodgkin Lymphoma and others as shown in figure 7.

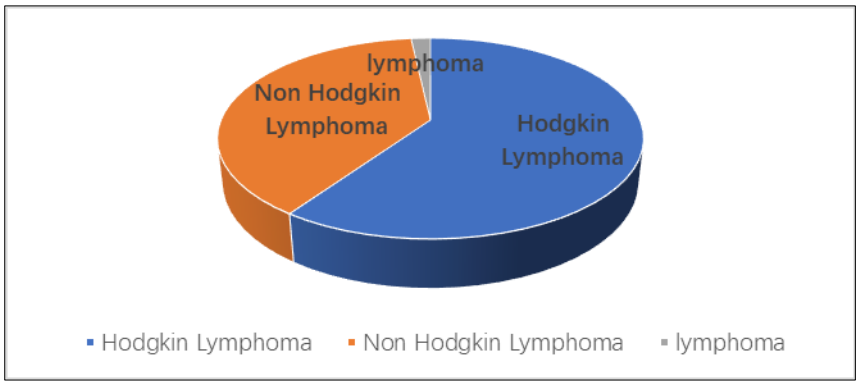

Figure 6 Incidence of Hodgkin to non-Hodgkin lymphoma

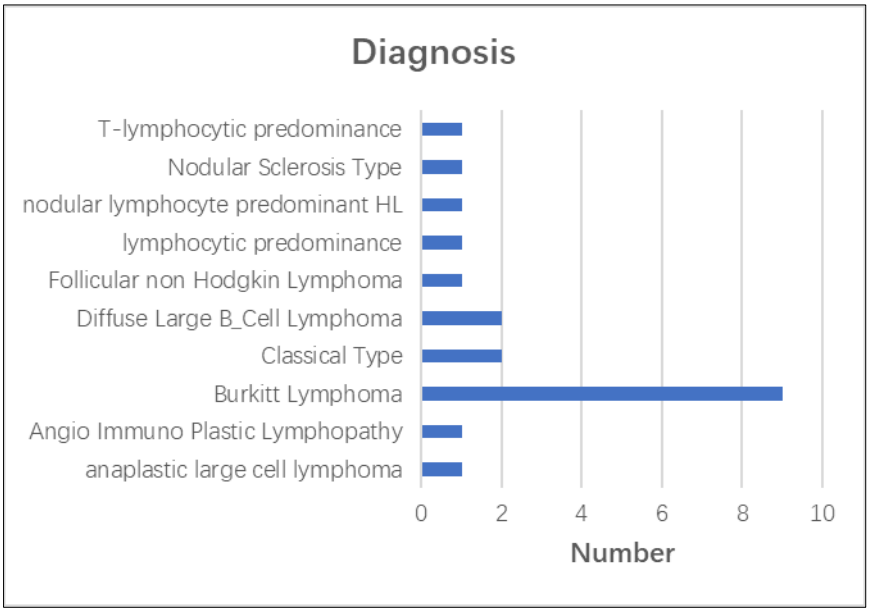

Figure 7 Incidence of non-Hodgkin lymphoma according to Histo-pathological diagnosis

Regarding tumor stage, eleven patients were diagnosed in stage 3 (37.9%), 9 in stage 4 (31%), followed by stage 2 (27.6%) and only one case being diagnosed in stage 1 (3.4%). See table 2 and figure 8. Keep in mind that this only comes out to 29 cases, meaning the stages of 30 of the cases cannot be determined from the records.

Table 2 Distribution of patients according to the stage of the tumor at diagnosis

Stage	Number	%
stage 1	1	3.4
stage 2	8	27.6
stage 3	11	37.9
stage 4	9	31.0
Total	29	100

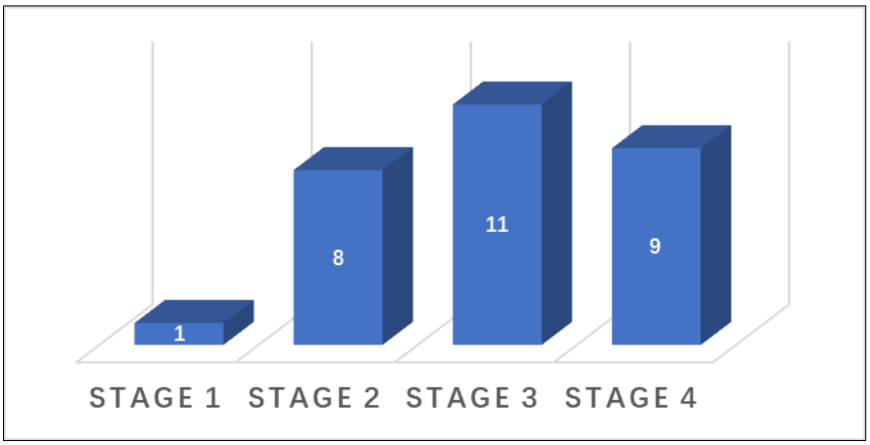

Figure 8 Distribution of patients according to the stage of the tumor at diagnosis

3.1. Symptoms

Most of the cases were asymptomatic at diagnosis, with sonography being normal. While some had abdominal pain and constipation. Others complained of fever, cough, headache, and neck swelling.

Additional recorded symptoms were spleen and neck enlargement as well as diarrhea.

4. Discussion

Lymphoma, the primary malignant tumor originating in lymphoid tissue, constitutes the third most prevalent pediatric cancer globally [14]. While relatively rare before the age of two, lymphoma incidence escalates with advancing age, positioning it as the fifth most common childhood cancer, accounting for 19% of cases [13]. Remarkably, lymphomas contribute to approximately 41% of all childhood malignancies. A previous study conducted in Benghazi in 2013 investigated 49 lymphoma cases, revealing 57% Hodgkin lymphoma and 43% non-Hodgkin lymphoma cases [13]. Our current study, comprising 59 cases, aligns closely with these proportions, with 59.7% Hodgkin lymphoma and 38.6% non-Hodgkin lymphoma. Contrasting findings emerge from Yemen's study (2004-2007), reporting 63.7% non-Hodgkin and 36.3% Hodgkin lymphoma cases among children under 18 [14]. In Tunisia (1993-2006), a male predominance of 29.1% in pediatric lymphoma cases is observed [13], consistent with our results. Within our study period (2014-2023), Burkitt lymphoma emerged as the most common non-Hodgkin lymphoma, akin to findings in Egypt (February 2004 to February 2012) [12]. Similarly, Saudi Arabia (1976-1981) noted a higher incidence in males, resonating with our observations. Saudi Arabia identified diffuse undifferentiated lymphoma as the most common non-Burkitt's type (67 cases) [15], diverging from our study, where Burkitt lymphoma dominated with nine cases.

In various African regions, Burkitt lymphoma incidence is notably high, linked to factors such as Epstein-Barr Virus (EBV), malaria, and HIV [16-18]. Brazil too has identified a higher prevalence of Burkitt lymphoma linked to EBV in regions with poorer socioeconomic conditions [19].

Global studies highlight the association between lymphomas and factors such as Human herpes virus 8, human T-cell lymphotropic virus, hepatitis C, Helicobacter pylori, and Epstein-Barr virus [20-23]. Burkitt lymphoma, in particular, has been associated with parental smoking [24].

In summary, our study aligns with certain global patterns, but differences in lymphoma prevalence and subtype distribution underscore the complex interplay of genetic, environmental, and viral factors contributing to these malignancies worldwide.

5. Conclusion

A total of 59 cases of pediatric lymphoma were diagnosed at Children's Hospital Benghazi during the period from 2014 to 2023, involving children within the age range of 2 to 14 years. The highest incidence was observed in the 3 and 4 age groups, with nine cases reported in 2017, 2019, and 2020. Notably, males constituted the majority, accounting for 69% of the cases. Hodgkin lymphoma emerged as the predominant type among pediatric lymphomas at Children's Hospital Benghazi, with 34 cases. Burkitt lymphoma stood out as the most common Non-Hodgkin lymphoma, comprising 45%

of cases, while other subtypes, including anaplastic large cell lymphoma and follicular non-Hodgkin lymphoma, were less prevalent, with an incidence rate of 5%. Upon examination of medical records, it was identified that stage 3 was the most frequently diagnosed tumor stage, representing 37.9% of cases. The majority of children experienced no complications; however, some presented with symptoms such as fever, neck swelling, and abdominal pain.

Compliance with ethical standards

Disclosure of conflict of interest

The authors have no conflict of interest.

Statement of ethical approval

"The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved."

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Faculty ethics committee and the Children Hospital in Benghazi

Statement of informed consent

Individual consent for this retrospective analysis was waived,

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