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Demographic Patterns and Clinical Features of Burkitt Lymphoma Among Patients Visiting Moi Teaching and Referral Hospital, Kenya

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ABSTRACT

***Background*:** Kenya is among the high-risk geographical zones especially for the African- endemic variant of Burkitt Lymphoma (BL). It accounts for up to half of all children cases of non-Hodgkin's lymphomas in tropical Africa. There is limited published data on the clinico-demographic features of BL at Moi Teaching and Referral Hospital (MTRH) despite it being a major center for referral of oncology patients from the North Rift, Western and Nyanza regions of Kenya.
***Objective*:** The main objective of this study was to describe the demographic patterns and clinical features of BL among patients attending MTRH from 2017 to 2022.
***Design*:** A descriptive cross sectional retrospective study design was used.
***Results*:** Out of the 85 cases studied, the most affected ages were between 6-10 years (36%). Males (64%) were affected almost twice more than females (36%). Rift Valley had the highest number of cases (42%), while Western and Nyanza regions contributed 25% each. The abdomen was the primary site of tumor in most cases (54%), while the jaw was affected in 30% of the cases. Combined abdomen and jaw involvement was seen in 4% of the cases. Weight loss was the most frequent symptom (33%), night sweats and fever were also noted. The most common clinical signs were lymphadenopathy (55%) and pallor (23%).
***Conclusion*:** Commonly affected age range is between 6-10 years, boys seen to be affected almost twice as much as girls. Rift Valley is the most commonly affected region. The most common presenting complaint is an abdominal mass with associated local symptoms and classical B-symptoms of fever, night sweats and weight loss.

Key words: Burkitt lymphoma, Demographic patters, Clinical features

INTRODUCTION

Burkitt lymphoma (BL) is a very destructive non-Hodgkin lymphoma (NHL) arising from mature, germinal or post germinal center B cells, characterized by rapid growth. Dr. Denis Burkitt first described the tumor in 1958 as "A sarcoma involving the

jaws in African children" The defining characteristic that drives proliferation of BL is a translocation in c-MYC oncogene from chromosome 8 to chromosome 14. Other rare variants involve translocation of the c-MYC oncogene from chromosome 2 to chromosome 8 and from chromosome 8 to chromosome 22. The result is over-expression of *c-myc* gene as well as rapid cell division [1]. Consequently, the tumor exhibits a very short duplication time of 1-2 days [1, 2].

BL pathogenesis is linked with Epstein Barr Virus (EBV) and malaria infection of B-cells. The common sites affected by Burkitt's lymphoma include the oral cavity, maxillofacial complex, and retroperitoneal tissues. The World Health Organization (WHO) classifies BL into three clinical variants according to the worldwide distribution patterns: The endemic (African), sporadic (non-endemic) and immunodeficiency associated types [3].

The endemic BL variant is a tumor that affects the jaw and the abdomen, mainly found in tropical Africa and New Guinea. It is more common in Africa, especially in the tropical regions where it contributes to 30-50% of all pediatric cancers. Estimated cases are a few per 100,000 to 18 per 100,000. EBV infection is almost always seen among subjects with this variant. This variant has also been discovered in malaria endemic areas of the world especially in Western Kenya. The peak age of incidence is 4-7 years and it occurs 2-3 times more commonly in males than females [3, 4].

The sporadic variant is distributed in regions where EBV prevalence is low such as Europe, United States and temperate regions of Africa. Less than 30% of the cases of this type are associated with EBV infection. It represents 1% of NHL in the United States with about 1400 new cases annually. There is also gender predilection towards males with a median age of occurrence of 30 years [5].

Immunodeficiency associated variant is primarily seen in people with HIV infections. It is less common in other immunodeficiency patients for example organ transplant recipients. Among individuals with HIV, Burkitt lymphoma typically affects those with a CD4 count of above 200cells/ microliter. In comparison with other HIV associated lymphomas, the rate of Burkitt lymphoma has not reduced with the introduction of potent antiretroviral therapy [6,7].

The prevalence of BL in Kenya reflects to that in other tropical African countries with the endemic variant being the most common. It has been reported that there is varied regional and tribal distribution of the tumor in various parts of Kenya. Over 50% of studied cases were found in Western and Nyanza regions. Correspondingly, the Luo and Luhya tribes were the most affected. 17.7% of the cases were from coastal region while relatively fewer cases were seen in other regions and their corresponding tribes [8]. Sporadic Burkitt Lymphoma is less associated with EBV. It's not considered endemic and presents as abdominal tumours, intestinal obstruction, enlarged masses in the Waldeyer's ring [9]. The Endemic type is common in Tropical regions where Malaria is endemic [4]. It has EBV association. Jaw tumour is the commonest presentation. Lymph nodes, breasts and ovaries are also affected [10]. Immunodeficiency associated variant is found in people with HIV and recipients of organ transplant [6]. It affects the bone marrow in more advanced stages. However, the patients may also have other symptoms, for instance loss of weight, night sweats and hotness of the body (B symptoms) [11]. Burkitt Lymphoma is a thus tumor of paramount medical importance in Tropical African countries. Kenya is among the high-risk geographical zones especially for the African- endemic variant. It accounts for up to half of all children cases of non-Hodgkin's lymphomas in tropical Africa [5]. It is significant due both to high morbidity and high mortality rates. Due to this fact, its relevance in African countries is well documented although Kenyan studies are scarce. In particular, there is limited data at

the MTRH children's hospital where patients from Western and North Rift region are usually referred. Data obtained from the study give an insight on clinical aspects, demographics and distribution of BL. Furthermore, information obtained will pave way for future researchers and help clinicians in the diagnostic processes and management of the tumor while enlightening the public on the various clinical aspects of BL.

MATERIALS AND METHODS

Study design

A descriptive cross sectional retrospective study design was used.

Study site

This study was conducted at Moi Teaching and Referral Hospital (MTRH), located in Uasin Gishu County, Eldoret, Kenya. It is Kenya's second largest national hospital. Within MTRH there is a children hospital, Shoe4Africa children's hospital (SACH) which operates as a teaching hospital governed by Moi Teaching and Referral Hospital (MTRH) in partnership with Moi University. It receives pediatric oncology patients from the regions around and all over the country.

Study population

Patients with confirmed cases of BL who sought treatment at the MTRH, Shoe4Africa children's hospital from 2017 to 2022. Data was obtained from patients' record files at the SACH Pediatric Oncology Department.

Sampling technique

The study employed a census sampling method.

Study criteria

Records of patients who had been diagnosed with BL from 2017 and 2022 were used.

Record with incomplete information, illegible writing, and unclear diagnoses were excluded. The age, sex, place of residence, the presenting complaints, the site of tumor, and clinical signs were captured. The data was tallied and recorded manually in the data abstraction sheets. The data collected was cleaned then coded and entered into Statistical Package for Social sciences (SPSS) for analysis. Descriptive statistics were applied. The data that had been extensively analyzed was conveyed graphically in the form of charts, tables and graphs.

RESULTS

A total of 101 files were reviewed for the study. The available files accounted for records from the year 2017 to 2022. Out of these, 85 met the selection criteria and were included in the research.

Age distribution

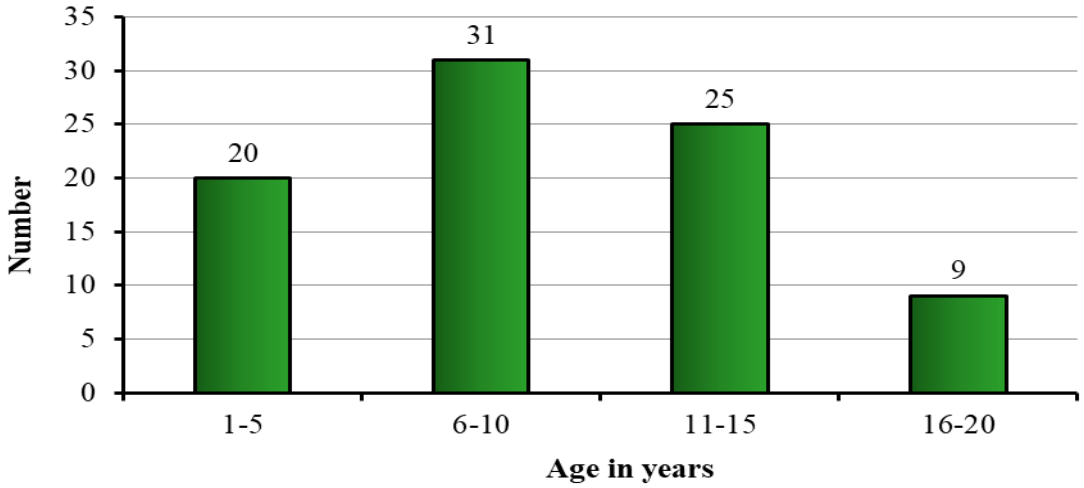

Figure 1: A simple bar graph showing ages of the patients at the time of diagnosis and the number of cases in the specified age ranges

Age in the record files was recorded in years, likely due to lack of national documents to ascertain the exact date of birth. For research purpose, the ages were classified into clusters of five years. The age was limited to those younger than 20 years as the SACH only deals with pediatric patients.

The number of cases rose from ages 1 to 5 years to a peak age range of between 6 and 10 years (31%). A gradual downwards trend was seen with advancement of age from the said peak range. The fewest cases (9) were in the range of 16 to 20 years accounting for 11% of the total.

Sex

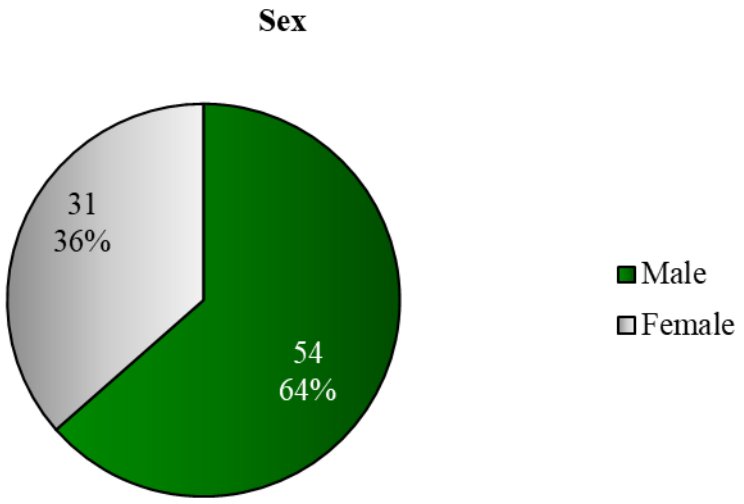

Figure 2: A pie chart showing sex distribution of BL among patients visiting MTRH

Of the 85 studied cases, 54 were male making up 64% of the total. Females (31) were fewer compared to males contributing 36% of all the cases. Therefore, the male-to-female ratio was 1.7:1

Geographic location

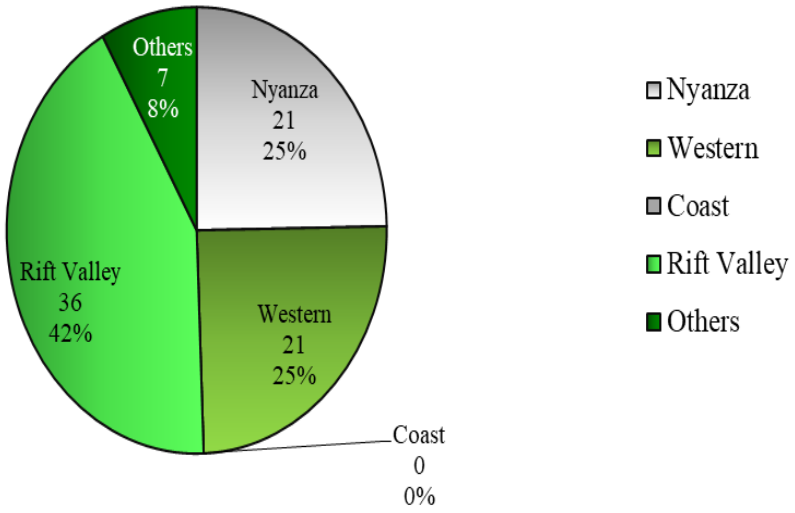

Figure 3: A pie chart showing the geographic location of patients visiting MTRH

Geographic location was based on regions that had high morbidity as recorded by previous studies. The addresses and places of residence of the patients were clearly highlighted in the record files. A more analytical indicator would have been the place of birth, although this was not captured in the files.

There were no cases from the coastal region in this study. Majority of the cases were from Rift Valley region, in which the study area was based (42%). Nyanza and Western regions each had 21 cases accounting for 25% apiece. Cumulatively, Nyanza and Western contributed about half of the cases A few other regions including Central and Eastern regions accounted for 8% of the total cases.

Primary site of tumor

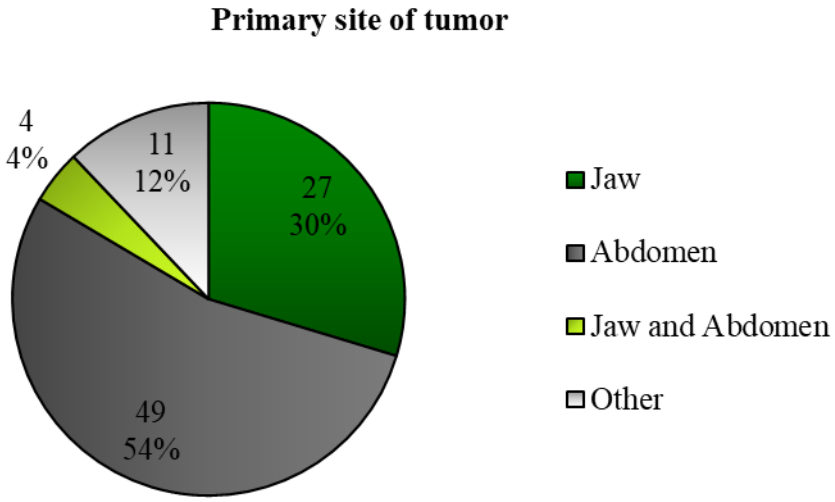

Figure 4: A pie chart showing the primary site of BL among patients visiting MTRH

The primary site of the tumor was indicated by the presence of a mass in a specific part of the body. For cases in which the presenting symptom was not a mass, the site where the symptoms were experienced was taken as the primary site. Some patients presented with a mass in more than one site hence the values captured are in reference to the frequency of occurrence of such.

Abdomen was the most common tumor site with 54% frequency of occurrence of a mass. The jaw was also significantly affected contributing 30% of all sites. Concurrent involvement of the jaw and abdomen in a single patient was encountered in 4 instances (4%). Other sites including the chest, spine, pelvis and thighs were also involved but with less incidents, cumulating to 12% of the total.

Presenting symptoms

Symptom	Number of Occurrences	Percentage
Weight Loss	41	33%
Fever	29	23%
Night Sweats	33	26%
CNS Symptoms	2	2%
Others	20	16%
Total	125	100%

Table 1: A table showing presenting symptoms of patients with BL visiting MTRH

The chief complaint, aside from a mass, in each file was recorded as the presenting symptom. Several patients presented with more than one symptom, hence only the frequency of occurrence of a particular symptom is represented in table 1.

Weight loss was the most frequent symptom (33%) followed closely by night sweats (26%) and fever (23%). CNS symptoms were only seen in two cases and these included headache and unspecified disturbance of vision. Others symptoms such as vomiting, toothache, cough, difficulty passing stool and other gastrointestinal disturbances occurred with a frequency of 20%

Clinical signs

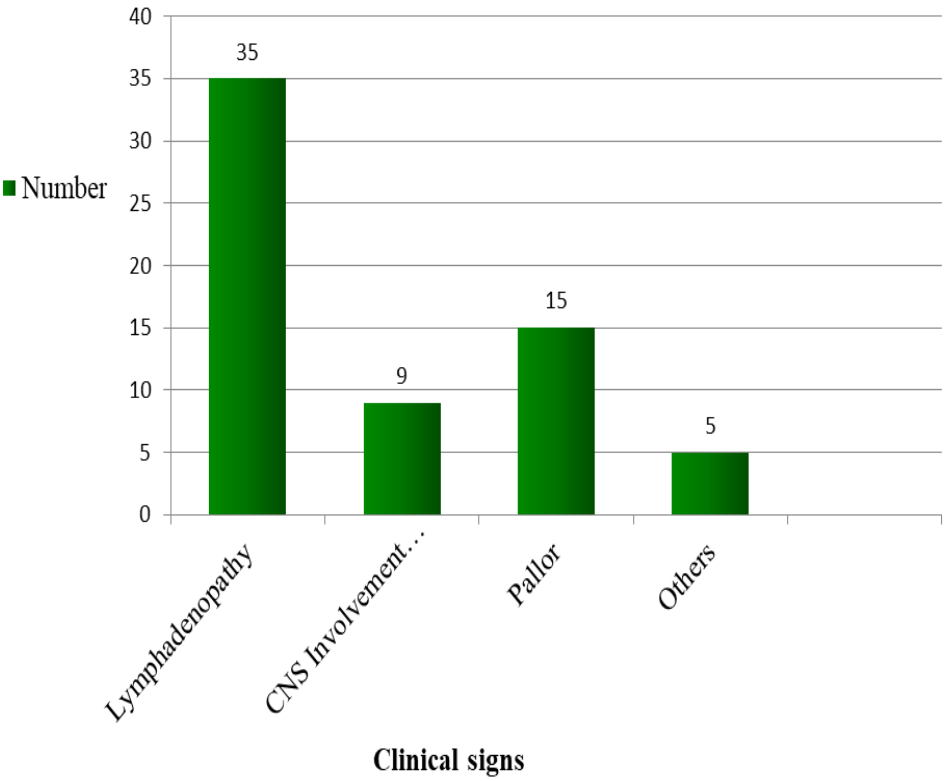

Figure 5: A bar graph showing the clinical signs of BL of patients visiting MTRH

Lymphadenopathy was the most common sign, seen in 35 of the cases (55%). Pallor was also encountered in 15 cases contributing 23%. Signs of CNS involvement were seen in 14% of the cases. Other signs such as dehydration, edema and jaundice were relatively rare and were seen in 8% of the total cases.

DISCUSSION

Burkitt lymphoma has been reported to highly affect children of ages 0-14 years in the tropics [12]. Similarly, in the current study, it was discovered that the most affected age range was from 6-10 years, which made 36 % of the total research population. The second most common age affected was children from age 11-15 years which made up 29% of the total study population. The least affected ages were 16-20 years, constituting 11% of the study population.

With regards to the sex distribution of Burkitt lymphoma, the male sex was the most affected consisting of 54 out of the 85 cases which translates to a percentage of 64%. The female sex was less affected constituting 36% of the study population. Estrogens are thought to be protective against lymphomas hence the less involvement of females [13, 14]. The overall male-to-female ratio was about 2:1. These

findings were similar to those of a study which showed that the male sex was more commonly affected by the endemic variant [12].

In terms of geographic distribution, Rift Valley had the highest number of cases (36) accounting for 42% of the total. This is perhaps due to the fact that the study area was based in this region. Notably, the Western and Nyanza regions were significantly affected both contributing about 50% of all the cases studied. These results are coincident with those on a previous study conducted by Mwanda O. and colleagues. Majority of the patients diagnosed with Burkitt lymphoma patients were referrals from these regions (8). Other regions of the country accounted for 8% of the cases. These regions have been reported to have less prevalence of the tumor. These regions include Central and Eastern Kenya. In contrast with the said study, there were no cases recorded from the Coastal region. An important factor that could have led to the finding is the availability of other national referral facilities in closer proximity to the Coastal region (8). The geographical regions accounting for most cases in Kenya are majorly malaria endemic zones. The risk for developing Burkitt lymphoma risk has been shown to have an association with *Plasmodium falciparum* infections [15,16].

The chief complaint for most, if not all of the cases was a mass in a specified part of the body. In a few cases, the presenting complaint was not a mass. For such, the site where symptoms were experienced was considered as the primary site of the tumor, because a mass is invariably present in about 80% of BL patients. Abdomen was the most commonly affected site, occurring with a frequency of 54%. There was significant involvement of the jaw as well (30%). These findings are contrary to those of previous studies that stated that for endemic variant, the jaw was more commonly involved than the abdomen. A Kenyan study revealed that the jaw was almost twice as affected as the abdomen [8].

In addition to the presence of a mass, other symptoms were also investigated. In terms of occurrence, weight loss was the most frequent symptom (33%) and this is perhaps due to the systemic catabolic processes associated with malignancy [14,17]. Fever (23%) and night sweats (26%) were also common. The process of development of these symptoms is unclear, however it is postulated that they occur as the body's immune system attempts to fight the malignancy [17, 18]. Therefore, in concurrence with a previous study, weight loss, fever and night sweats, collectively known as B-symptoms, were frequently encountered [11].

A few other symptoms occurred with a frequency of 20%. These included CNS manifestations; Headache and visual disturbance; toothache; cough and gastrointestinal disturbances; vomiting and difficulty in passing stool. It was concluded that these were due to local effect of the masses on adjacent structures

Clinical signs were obtained from the findings of clinical examination which were recorded as jaundice, pallor, cyanosis, lymphadenopathy, dehydration, edema and cyanosis. However, records of clinical findings were missing in some of the files. CNS signs included diminished reflexes, peripheral weakness, visual defects and mild confusion. Burkitt Lymphoma is a tumor of the immune system and therefore, it was plausible for lymphadenopathy to be the most common clinical sign in more than half of the cases (55%). Notably, pallor was encountered in a good number of patients (23%). CNS signs were present in 14% of the cases. Other signs were less commonly seen including, dehydration, edema and jaundice. The clinical signs encountered were consistent with those of a recorded in other studies [5, 11].

CONCLUSION

Despite the rarity of Burkitt lymphoma globally, its apparent relevance in Kenya cannot be underestimated. East Africa and Kenya in particular, contribute a large percentage of the cases of endemic BL.

Early diagnosis and treatment are crucial in achieving a higher success rate and reduction of mortality.

The most commonly affected age range is between 6 and 10 years. Boys are affected almost twice as much as girls are. The Rift Valley is the most commonly affected region with the tumor, although this could be due to the fact that the study area was based in this region. Western and Nyanza regions also contribute significantly to the numbers of Burkitt lymphoma, contributing cumulatively to about half of all cases.

The most common presenting complaint is a mass with associated local symptoms. The mass is seen more commonly in the abdomen than in the jaw, contrary to the findings of previous studies. However, in a few cases, there can be a mass in both the abdomen and the jaws. Aside from a mass, the classical B-symptoms of fever, night sweats and weight loss are also frequently encountered. Other constitutional symptoms such as headache are also seen. The local effects of the mass also result in toothache and abdominal symptoms. During clinical examination, lymphadenopathy and pallor are common, while jaundice, dehydration, and edema are less often seen. Signs of CNS involvement are also noted as motor weakness, visual defects and mild confusion in a small subset of patients.

Ethical considerations

Authorization to conduct the study was obtained from the MTRH/Moi University - Institutional Research and Ethics Committee (IREC), approval number FAN: 0004372. Confidentiality was ensured by omitting names of patients in the data collection sheets and kept in a password protected laptop during data entry.

Declaration by Authors

Ethical Approval: Approved

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