



# Profile of Childhood Cancers Diagnosed at Kenyatta National Hospital, Kenya: A Two-Year Study

Rioki Josephine Nyabeta

Department of Human Pathology, College of Health Sciences, University of Nairobi. P.o. Box 19676-00202, Nairobi, Kenya.

## ARTICLE INFO

### Article history:

Received: 13 October 2018;

Received in revised form:  
7 November 2018;

Accepted: 17 November 2018;

### Keywords

Childhood cancers,  
Profile of childhood cancers,  
Tumors.

## ABSTRACT

Childhood cancers have been on the rise globally. There is insufficient data on patterns of childhood cancers in Kenya. We aimed at profiling and identifying the stages of these malignancies during 2016 and 2017 at Kenyatta National Hospital in Kenya. The age most affected with cancer was 0-4years (46.9%) followed by 5-9 years (31.1%) and 10-15 years (22%). 29.8% of the cancers were diagnosed at In-situ stage. CNS tumors were the most common and the least was lymphomas. The frequency was found to be higher in boys than girls.

© 2018 Elixir All rights reserved.

## Introduction

Cancer is an emerging global health problem. Both adults and children are affected by this disease. Over 200, 000 children develop malignancies as reported worldwide per year. About 80% of these are found in unindustrialized countries [1]. A major cause of death among children below fifteen years of age is cancer [2]. In Europe and USA, for instance, incidences of childhood CNS tumors are higher than those reported in Africa. The developed world records a male to female ratio of 1.2:1 in cases of CNS tumors reported [3]. The survival rate of children with cancer in Kenya is lower compared to that in developed countries. At Kenyatta National Hospital, childhood cancers accounted for 15% of all cancer patients admitted between 1998 and 2008 [4]. Much has not been documented about childhood cancers in our setup.

Childhood cancers are distinctive from adult cancers since they present with atypical features in their nature, distribution and even in diagnosis. This poses a lot of challenges in patient management [2]. Though occurrence of these cancers are rare, their unique characteristics necessitate intense workup to achieve the right diagnosis and management. Underreporting of these cancers has hindered the process of determining the actual prevalence of these cancers in most countries [5]. It is worth noting that 30% of cancers are curable if diagnosed promptly [4,6]. Early detection and prompt case management can lead to reduction of mortality and morbidity associated with these cancers [7]. However, this can only be possible if recording of cases (cancer registry) is done properly. This would guide in describing the prevalence of the cancers and in return, inform planning on cancer control and management in children [5].

Due to unavailability of proper childhood cancer registry or childhood cancer database, there is a lack of insight into the profile of childhood cancers in Kenya. This research was therefore designed to establish the patterns of cancers among

children who were diagnosed at Kenyatta National teaching and referral hospital between 2016 and 2017.

## Materials and methods

A retrospective study using laboratory archived records at Kenyatta National teaching and referral hospital between January 2016 to December 2017 was conducted. Included were all children between the ages of 0-15 years whose cancer diagnosis was confirmed by Histology. Parameters such as age, sex, geographical locations/area of residence and stage at cancer diagnosis were designed to be used to study the profile of childhood cancers diagnosed in the facility. However, data on geographical locations/area of residence was not documented in the records evaluated therefore this variable was not studied. Stage at diagnosis included; In-situ stage, localized stage, regional stage, distant stage, and unknown stage. Data was analyzed by SPSS version 20 software.

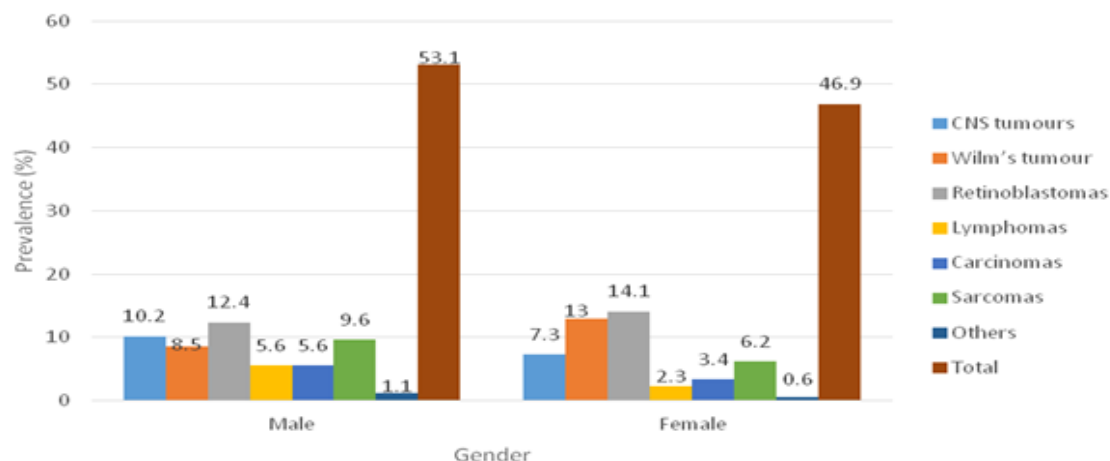
## Results

A total of 177 patients' records were evaluated. Analysis revealed that retinoblastomas were most common among children aged between 0 and 4 years (19.2%, n=34) whereas carcinoma was the least (0.6%, n=1). Central Nervous System tumors (CNS) were most prevalent among children aged between 5 and 9 years (15.3%, n=27) whereas retinoblastoma were the least, and sarcoma were the most common among children aged between 10 and 15 years 15.8% (n=28). Retinoblastoma was not detected in children between 10 and 15 years. Overall, CNS tumors were the most detected (26.6%) followed by Retinoblastoma (21.5%), Wilms tumors (17.5%) and Sarcoma (15.8%). Least detected were carcinomas (9.0%), lymphomas (7.9%) and others (1.7%) among the study population. The age group most affected with cancer was 0-4years (46.9%) followed by 5-9 years (31.1%) and 22% in 10-15 years (Table 1).

**Table 1. Distribution of childhood cancers according to age groups.**

Cancer Types	Age in years			Total
	0-4	5-9	10-15	
CNS tumours	6.8% (12)	15.3% (27)	4.5% (8)	26.6% (47)
Wilm's tumors	14.4% (25)	2.8% (5)	0.6% (1)	17.5% (31)
Retinoblastoma	19.2% (34)	2.3% (4)	0.0% (0)	21.5% (38)
Lymphomas	1.7% (3)	3.4% (6)	2.8% (5)	7.9% (14)
Carcinomas	0.6% (1)	2.8% (5)	5.6% (10)	9.0% (16)
Sarcomas	3.4% (6)	4.0% (7)	8.5% (15)	15.8% (28)
Others	1.1% (2)	0.6% (1)	0.0% (0)	1.7% (3)
<b>Total</b>	<b>46.9(83)</b>	<b>31.1(55)</b>	<b>22.0%(39)</b>	<b>100.0(177)</b>

Among the studied population, 53.1% (n=94) were boys whereas 46.9% (n=83) were girls. Retinoblastoma and Wilm's tumors were most common in male (14.1% and 13% respectively), while female had a prevalence of 12.4% Retinoblastoma and 10.2% CNS tumors (Fig.1). The study findings show that boys had a slightly higher prevalence of cancer compared to girls. Male: female was 1.12:1.

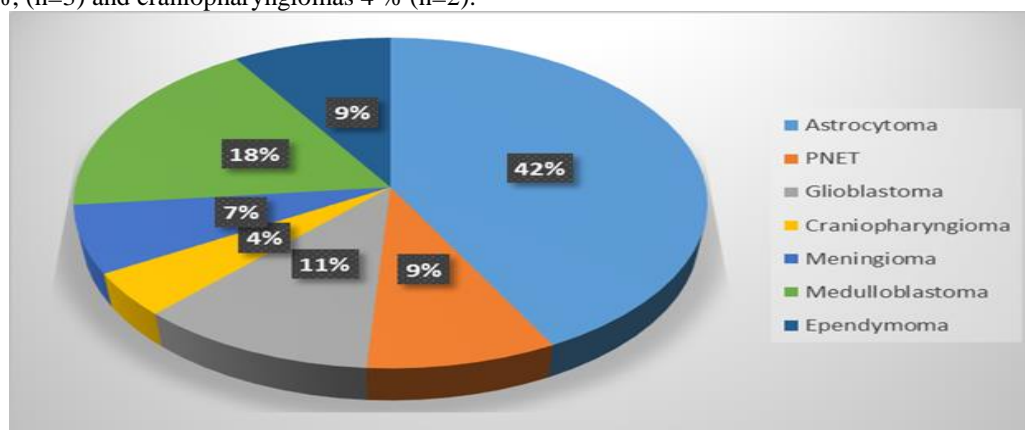
**Figure 1. Distribution of cancer based on Gender.**

Among 177 patients' records evaluated, only 84 had stage at diagnosis indicated. 29.8% of cases were diagnosed at In-situ stage, of which 20.2% (n=17) were CNS tumors and 9.5% (n=8) of tumors were retinoblastomas. 27.4% of tumors were diagnosed at localized stage and 9.5% of these were Wilm's tumors and retinoblastoma whereas 6% and 2.4% were CNS tumors and sarcomas respectively. 22.6% of tumors were diagnosed at regional stage where 13.1% were retinoblastomas, 8.3% Wilm's tumors and 1.2% were carcinomas. 19.4% of the tumors were diagnosed at distant stage among which 13.1% were CNS tumors, 4.8% were retinoblastomas and 1.2% was Wilm's tumors. 1.2% were diagnosed at unknown stage (Table 2).

**Table 2. Stage at diagnosis of childhood cancers at Kenyatta National Hospital.**

Stage at Diagnosis	In-situ	Localized	Regional	Distant	Unknown
CNS tumor	20.2% (17)	6.0% (5)	0.0% (0)	13.1% (11)	0.0% (0)
Wilm's tumor	0.0% (0)	9.5% (8)	8.3% (7)	1.2% (1)	0.0% (0)
Retinoblastomas	9.5% (8)	9.5% (8)	13.1% (11)	4.8% (4)	0.0% (0)
Lymphomas	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
Carcinomas	0.0% (0)	0.0% (0)	1.2% (1)	0.0% (0)	1.2% (1)
Sarcomas	0.0% (0)	2.4% (2)	0.0% (0)	0.0% (0)	0.0% (0)
Other	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)
<b>Total % (n)</b>	<b>29.8 (25)</b>	<b>27.4 (23)</b>	<b>22.6 (19)</b>	<b>19.4 (16)</b>	<b>1.2 (1)</b>

In the distribution of childhood CNS tumors (Figure 2), astrocytomas were the most common 42% (n=20). The other CNS tumors in their respective orders were: medulloblastomas 18% (n=7), glioblastomas 11% (n=5), ependymomas 9% (n=4), meningiomas 7%, (n=3) and craniopharyngiomas 4% (n=2).

**Figure 2. Pie chart showing the distribution of childhood CNS tumors among the study population.**

## Discussion

Majority of the study population was composed of male, 53% versus female 47%. Male: female was 1.12:1. This is consistent with studies conducted in India [2,8]. This could be due to the fact that more boys accessed specialized healthcare compared to girls [9]. Age group 0-4 years had the largest number of participants (46.9%) in contradiction to that observed in India (34.5%) in the age group of 5-9 years. Wilm's tumor was more common in girls than boys, findings that are similar to other study findings [10].

From this study, the most common cancers were, CNS tumors (26.6%), Retinoblastoma (21.5%), Wilm's tumors (17.5%) and Sarcoma (15.8%). This is in contrast to the study whose findings were lymphomas (24.2%), retinoblastomas (17.4%) and leukemia (14.3%) [2]. Findings from this study also show a sharp contrast from a report presented by a consultant pathologist at Kenyatta National Hospital in Kenya, which indicated that the most prevalent childhood cancers were lymphomas and leukaemia [6]. This could be due to the fact that data was obtained from hospital admission in the previous report as opposed to the current report. Lymphoma could also have been reported much because of the lymphoma project that was on previously in the facility in which this study was done. In a study in the USA, Leukemia was (30.2%), CNS (21.7%) and lymphomas (10.9%) [11]. Study findings for CNS tumors and retinoblastoma in this study compares with those in USA. Though not most frequent from this study (7.9%), the prevalence of lymphoma in the USA study (10.9%) is comparable to the study findings in this study.

It is documented that retinoblastoma is most common in children under 5 years, a report which is supported by the findings of this study and other previous studies [8]. Retinoblastomas was the second common (21.5%) cancer identified in this study. It was frequent in age group of 0-4 years. These findings are similar to those from south-western Nigeria [12] where they found it to be the second most common among children. The study findings were also similar to those found in India where the most age group affected by this cancer was in children under 5 years.

CNS tumors were the most common cancers (26.6%) among children who were diagnosed of cancers during the study period. These findings contrast those of developed countries like Britain where CNS cancers are second most cancers (22-25%) found in children [13]. Findings from this study also contrast the report from the United States [10,14] which indicated that CNS cancers ranks second amongst frequent cancers (21%) in children. It also contrasts an earlier study done in Kenyatta National hospital which indicated that lymphoma was the most common cancer (51.3%) in children [15]. This could be due to the source of study population. In this study, used was laboratory records/data whereas the other studies used hospital records. Most likely the population could have included those referred for further management after laboratory testing in other facilities. Another possible explanation of the difference could be associated with the difference in health status of the population; the previous study was done during AIDS epidemic period. From this study, astrocytoma was the most frequent among the CNS tumors identified. It constituted 42% of all CNS tumors. This finding is consistent with that from Dhaka and the United States [2,10] where it is noted that astrocytoma was the most common of all CNS tumors. In a study done in India, astrocytoma was the prevalent type of cancer diagnosed in children [16] findings which are similar to those of this study.

The stage-based analysis revealed that most cancers were discovered at the In-situ stage, of which most were CNS tumors (20.2%, n=17). Wilm's tumors and sarcomas were discovered at the localized stage while retinoblastomas and carcinomas were diagnosed at regional stages. These findings contrast with those of a study done earlier in Kenya, which indicated that most cancers are diagnosed at late stages, i.e., regional and distant stages [17]. The difference could be due to improved diagnosis as well as patients seeking healthcare at earliest opportunity as compared to the past. Due to the direct and predictable nature of CNS symptoms, CNS tumors are easy to diagnose, and this could be the major reason why they are mostly discovered at the In-situ stage. Nonetheless, it is worth noting that the cancer stages had been included in only 84 cases, which was 47.5% of the total 177 cases recorded, thus making it difficult to do a complete stage-based analysis.

## Conclusion

CNS tumors, retinoblastomas and Wilm's tumors and sarcomas are the most prevalent malignancies among children under 15 years of age. Carcinomas and lymphomas were the least. The stage-based analysis reveals that many childhood malignancies are discovered at the In-situ stage, of which most are CNS tumors.

## Recommendation

Emphasis should be made on the importance of filling out all the demographics and other information required such as stage at diagnosis during cancer reporting as this will help establish childhood cancer patterns more elaborately. A larger study including hospital based data and longer period should be conducted to establish the actual profile of childhood cancers in Kenya. This can then be used to plan for resource mobilization in an effort to improve the care and survival rates of children in Kenya.

## Limitation of the study

Since this was a laboratory based study, it is not representative of the general population in Kenya.

## References

- 1.Arora R.S, Eden T, Kapoor G. "Epidemiology of childhood cancer in India". *Indian J Cancer*. 2009; 46: 264-73.
- 2.Jabeen S, Haque M, Islam MJ, Talukder MH. "Profile of Paediatric malignancies": A five-year study. *J Dhaka Med Coll*. 2010; 19(1):33-38.
- 3.McKinney P. "Childhood brain tumours: Epidemiology and Risk Factors. WHO workshop," 2004, (pp. 1-32). Istanbul: Istanbul 9/10.
- 4.Kenya cancer statistics and national strategies. Retrieved from Kenya Network of cancer Organizations: <https://kenyacancernetwork.wordpress.com/kenya-cancer-facts/>
- 5.WHO. (2015). GLOBOCAN 2012: "Estimated cancer incidence, mortality and prevalence worldwide in 2012. Retrieved from International Agency for Research on Cancer": [http://globocan.iarc.fr/Pages/fact\\_sheets\\_cancer.aspx](http://globocan.iarc.fr/Pages/fact_sheets_cancer.aspx)
- 6.Jessie Githanga (Feb 2013) pediatric oncologist at Kenyatta National Hospital data presentation.
- 7.Young G, Toretsky JA, Campbell AB, Eskenazi AE. "Recognition of common childhood malignancies". *American Family Physician*, April 1, 2000, 1 pp. 2144-2154.
- 8.Munlima Hazarika, Manigreeva Krishnatreya, Cidananda Bhuyan et al. "Overview of Childhood Cancers at a Regional Cancer Centre in North-East India". *Asian Pacific Journal Cancer Prevention*, 2014, 15 (18), 7817-7819.

9. Pearce MS and Parker L, "Childhood cancer registrations in the developing world: still more boys than girls". *Int J Cancer*, 2001, 91:402-6.
10. Elizabeth Ward, Carol DeSantis, Anthony Robbins, Betsy Kohler, Ahmedin Jemal, "Childhood and Adolescent Cancer Statistics", 2014. *CA CANCER J CLIN* 2014; 64:83-103.
11. Ferlay J, Bray F, Pisani P, Parkin DM. *GLOBOCAN 2002: "Cancer Incidence, Mortality and Prevalence Worldwide"*. Lyon: IARC Press; 2004.
12. Ayodeji O, Agboola J, Adekanmbi F A, Musa A A, Sotimehin A S, Deji A M. "Pattern of childhood malignant tumours in a teaching hospital in south-western Nigeria". *MJA*. 2009, 190(1):12-4.
13. Stiller Ceditor, *Childhood cancer in Britain: "Incidence survival, mortality"*. Oxford: Oxford University Press; 2007.
14. Blaney SM, Haas-Kogan D, Poussaint Y, et al. "Gliomas, ependymomas, and other nonembryonal tumors". In: Pizzo PA, Poplack DG, eds. *Principles and Practice of Pediatric Oncology*. 6th ed. Philadelphia, PA: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010:717-771.
15. Macharia WM. "Childhood cancers in a referral hospital in Kenya: a review". *East African Medical Journal*, 1996, 647-650.
16. Jain A, Sharma MC, Suri V, et al. "Spectrum of pediatric brain tumors in India: A multi-institutional study". *Neurol India*, 201, 59, 208-11.
17. Topazian H, Cira M, Dawsey SM, Kibachio J, Kocholla L, Wangai M, Welch J, Makeda JW, Kalina D, Galassi A. "Joining forces to overcome cancer: The Kenya cancer research and control stakeholder program. *Journal of cancer policy*, 36-41.

#### **Acknowledgment**

I acknowledge the support of Professor Angela Amayo of the department of Human Pathology, University of Nairobi for giving insight towards this research, Ms. Theuri, Ms. Kimilu and Mr. Osimbo of the University of Nairobi for assisting in data collection and analysis.