ORIGINAL ARTICLE

Epidemiological profile of childhood cancer at the Lubumbashi University clinic in the Democratic Republic of Congo

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ABSTRACT

Background: Cancers in children under 17 years of age have specific epidemiological and management characteristics. The objective of this study was to determine the epidemiological profile of childhood cancers in Lubumbashi.

Methodology: A cross-sectional descriptive study was conducted in the University Clinics of Lubumbashi from 2018-2019. Data collection was carried using a statistical form with a number of parameters.

Results: In this study, 99 of the 3024 cases of children who visited the paediatric ward during the study period were diagnosed with cancer, a prevalence rate of 3.27%. Only (71.7%) of the cases had consulted a general practitioner at the first sign of illness. Retinoblastoma being the first childhood cancer with 29.3%, followed by kidney tumours (23.2%), lymphomas (13.1%) and leukaemias (12.1%) all combined forms. 87.9% had easy access to chemotherapy. Among these, (28.7 %) hadchemotherapy and surgery with a curative aim. Childhood tumours show a remission in (20.7 %), 35.6 % of deaths and almost (27.6 %) remain under background treatment.

Conclusion: Diagnosis and early treatment continue to be crucial in reducing mortality among children suffering from cancers.

INTRODUCTION

Cancer is a real health problem worldwide.[1,2] It is one of the most common causes of death in adults.[3] However, it is relatively rare in children under the age of 15[4] and accounts for only 1 to 4% of tumours in the population.[5] Cancer accounts for one in ten deaths around the world.[6,7] Cancer has become a public health problem in the developing world, having long been considered a scourge in the first world countries. According to the International Classification of Childhood Cancer the most common diagnosis in children under the age of 15 are leukaemia (34 %), brain tumours (23 %) and lymphoma (12 %).[6]Acute lymphoblastic leukaemia,

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astrocytoma, neuroblastoma, Non-Hodgkin's lymphoma and nephroblastoma are the most common single diagnosis.[8] The forecasts for 2030 indicate a 50% increase in cancer rates, with 15 million new cases per year and an annual fatality rate of 10 million in all age groups.[5] In 2022, China had approximately 4.82 million cases with 3.21 million deaths, whilst United States recorded 2.37 million cancer cases with 640 thousand deaths.[9] Ghana recorded a 1.4% increase in new cases whilst Rwanda had 10% rise.[10] Mortality decreases significantly in developed countries and remains high in developing countries.[7]In the coming decades, cancer will surpass infections and parasitic diseases as the leading cause of morbidity and mortality.[11] It is useful to determine in the years to come the prevalence of cancers in Lubumbashi, the risk factors, the mode of treatment and the survival in particular for the most frequently encountered cancers. This requires systematic and prospective data collection. This study was designed to determine the epidemiological profile of hospitalised paediatric cancersand to propose the re-launch of a national cancer registry at the Lubumbashi University Clinics (CUL).

METHODOLOGY

From January 2018 to December 31, 2019, a transversal descriptive study was conducted at CUL. The study focused on 99 patients with childhood cancer who visited the paediatric oncology unit. We prospectively evaluated the selected patients from our cohort of 99 cancer children who met the inclusion criteria following: a diagnosis retained at the level of the oncology unit after paraclinical or histological examinations, the informed consent of the parents or guardians who signed for them to participate in the study.

The data was collected using a study form with several elements: age, sex, age at the onset of the first signs of the disease and family history. The socio-economic level has been categorized into three levels: low, medium and high according to the classification of Traissac *et al*.[12] In order to define coherent entities, a grouping of the different types of cancers was carried out according to the location of the tumour as defined by the International Classification of Childhood Cancer, 3rd Revision (ICC3).[6] The paraclinical diagnosis of thetumour has established based on the operational definition of the CUL Anatomy Pathology Unit. We calculated crude incidence rates (CRIs) in the two age groups of young children (0-9 years) and adolescents (9-17 years), estimated by relating observed cases to person-years calculated from approximate annual demographic data for Haut-Katanga provided by the Lubumbashi Bio Statistical Institute.The data were entered using Excel software and analysis was performed using STATA software version 12.1 (StataCorp LLC, TX, USA).

Ethical considerations

The study was approved by the Lubumbashi University Medical Ethics Committee (UNILU/CEM/135/2018). The data used in this study do not contain personal information. All parents of children with cancer have been given an explanation of study aims and principles.They were informed in writing of their consent for participation in the trial. The Declaration of Helsinki was followed during the study.

RESULTS

Sociodemographic Characteristics

Of a total of 3,024 cases of children who had consulted the paediatric department during the study period, we recorded 99 cases of childhood cancers combined that is 3.72 % of total hospitalizations,males accounting to56.6% against 43.4% females.In 2018, there were slightly more cases than in 2019 with 53 cases (53.5%) and 46 cases (46.5%) respectively the mean age was 5.67 ± 3.85 years, varying between 8 months - 17 years.

52.2% of the patients resided in Lubumbashi andtheremainder of the cases came from other provinces and other countries.71 children (71.7 %) had consulted a general practitioner at first contact and among them, twenty-two (22.22%) had also consulted a traditional healer or seen before the medical consultation (**Table 1**).

In both age groups, the most common tumours were retinoblastoma found in 29 cases (29.3%). Kidney tumours take second place with 23 cases (23.2%) followed by lymphomas and leukaemia of all forms with 13 cases (13.1%) and 12 cases (12.1%), respectively, as well as the other types of cancer observed in 22 cases (22.2%) (T**able 2)**.

Table 1. Patient/socio-demographic characteristics (n=99)

variables		Frequency	Percentage (%)
Age (years)			
	0-8	62	62.6
	9-17	37	37.3
Sex			
	Man	56	56.6
	Female	43	43.4
Socio-economic level			
	Down	69	69.7
	Means	22	22.2
	High	8	8.1
Origin			
	Lubumbashi	52	52.5
	outside Lubumbashi	47	47.5

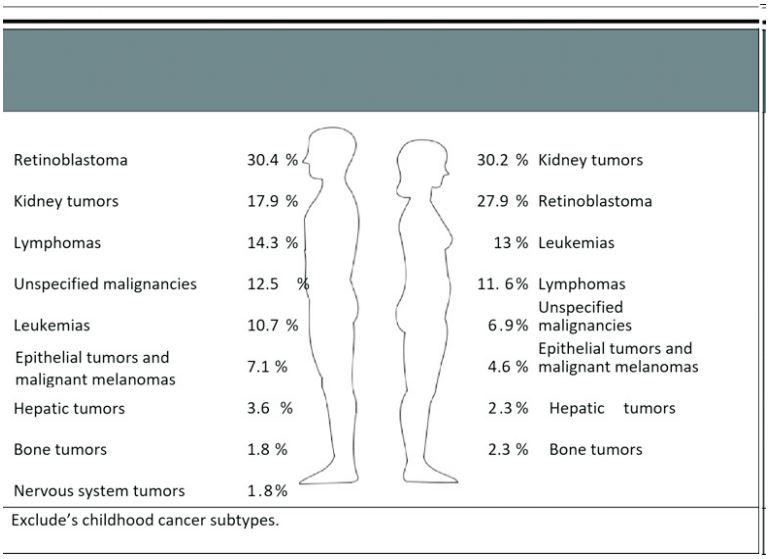
Table 2. Frequency of childhood cancer (n=99)

Diagnosed groups and subgroups	N=99 (100%)	0 to ≤9 years			>9 to ≤17 years		
		n(%)	M/F	TIB (10^6)	n(%)	M/F	TIB (10^6)
Retinoblastomas	**29(29.3)**	**16(16.1)**	**1.4**	**8.8**	**13(13.1)**	**1.2**	**8.0**
Kidneytumours	**23(23.2)**	**14(14.1)**	**0.7**	**13.5**	**9 (9.2)**	**0.9**	**13.0**
-Nephroblastoma	20(20.2)	11 (10.9)	-	1.3	9 (9.2)	-	1.1
-Kidney carcinomas	3 (3.2)	3 (3.2)	-	0.2	0 (0.0)	-	0.5
Lymphomas	**13(13.1)**	**5(5.0)**	**1.3**	**2.9**	**8(8.1)**	**1.3**	**2.9**
-Hodgkin's lymphoma	2 (2.02)	1 (0.7)	1.1	0.8	1(0.9)	1.4	1.5
-Non-Hodgkin lymphomas	2 (2.02)	1(0.7)	1.1	0.8	1(0.9)	0.9	1.8
-Burkitt 's lymphoma	8 (8.1)	3(1,2)	1.2	1.9	5(3.7)	1.1	0.9
-Lymphomas without other indications	1 (1.01)	0(0,0)	-	0.2	1(0.9)	-	0.1
Leukaemias	**12(12.1)**	**7(7.1)**	**1.5**	**6.0**	**5(5.1)**	**0.9**	**3.8**
-Lymphoid leukaemia	5 (5.1)	2(1.3)	1.0	2.2	3(2.1)	1.2	1.7
-acute myeloid leukaemia	6 (6.1)	4(3.4)	1.3	1.8	2(1,2)	1.5	2.1
-Leukaemias without other indications	1 (1.01)	1(0.5)	1.4	1.4	0(0,0)	1.1	1.5
Other tumours	**22(22.2)**	**13(13.2)**	**1.3**	**2.9**	**10(7.8)**	**1.4**	**1.9**
-Nervous system tumours	1 (1.01)	0(0,0)	1.1	0.8	1(1.7)	1.0	1.7
-bone tumours	2 (2.02)	2(2.7)	1.1	0.8	0(0,0)	1.3	1.6
-Liver tumours	3 (3.2)	1(1.7)	1.2	1.9	2(2.7)	1.2	2.3
-soft tissue sarcomas	0 (0.0)	0(0,0)	-	0.2	0(0,0)	1.3	0.1
-Epithelial tumours and malignant melanomas	6 (6.1)	3(3.1)	1.2	1.3	3(3.9)	1.2	2.1
-Unspecified malignancies	11(11.1)	7(7.1)	1.1	4.1	4(4.1)	0.8	3.0

Frequency (n), percentages (%), sex-ratio (M/F) and crude annual incidence rate (TIB) of childhood cancers in Lubumbashi/DR Congo.

In male children the most common cancers were Retinoblastoma (30.4%), Kidney tumours (17.9%) and lymphomas (14.3%). On the other hand, among girls, the most frequent cancers were kidney tumours (30.2%), retinoblastoma (27.9%), and leukaemia (13%) (**Figure 1**).

Figure 1. Incidence of paediatric cancer by gender at CUL



12.1% of patients did not have easy access to treatment, whilst (87.9%) had easy access to chemotherapy. Among these (28.7 %) chemotherapy and surgery with a curative aim and (3.5 %) targeted therapy. In their evolution after starting treatment during the period of our study, childhood tumours show a remission in (20.7 %) and almost (27.6 %) remain under background treatment. It was noted that a significant number of patients (10.3%) lost sight of and discontinued treatment. The number of deathsrecorded were 35.6 % (**Table 2**).

Table 2: time to diagnosis, management and treatment results

Variables		Frequency	Percentage (%)
Year of diagnosis (n=99)	2018	53	53.5
	2019	46	46.5
First consultation	General practitioner	71	71.7
	paediatric oncologist	6	6.1
	traditional healer	22	22.2
Treatment accessibility	Yes	87	87.9
	No	12	12 .1
Treatment (n=87)	Chemotherapy		
	- Palliative	9	10.3
	-Curative	25	28.7
	Healing hormone	7	8.1
	Surgery		
	- Radiotherapy	18	20.7
	- Curative	25	28.7
	Targeted therapy	3	3.5
Treatment results	Delivery	18	20.7
	Death	31	35.6
	Lost view	9	10.3
	Under treatment	24	27.6
	Transfer	5	5.8

DISCUSSION

Cancer is an abnormal cell proliferation that escapes regulatory mechanisms, invading and destroying the tissues in which they develop, capable of early dissemination in the body in children, and likely to recur after treatment.[13] Due to the lack of national cancer registration in most developing countries, data on cancer epidemiology and mortality are only expressed as relative frequencies.[14] We found a prevalence 3.27 % (99 cases) of childhood cancer in Lubumbashi. The number of cases per year (53.5 % in 2018 and 46.5% in 2019) in our study was lower than in the literature in general and particularly in the capital of the DRC.[15]

In fact, our hospital is a hospital-university structure of the Province of Haut Katanga. The average age reported was (3.41-5.47years). In Africa,South of the Sahara, the mean age is 4.3 - 6.7 slightly higher than the age in our region.[16,17] The highest prevalence is among children aged 0-8 years, accounting for 55.6% of cases. They're about 10 years younger than patients in the developed world, but about the same age as patients in the developing world. A young population could foster this. Factors such as infection and poor hygiene predominate. The prevalence reported in this study does not represent all cases of childhood cancer.

We observed a male predominance with a sex ratio of 1.3. According to Steliarova-Foucher *et al*.[4], this strong masculine representation is explained by the social impact of cancer on the male subject in an African environment, who should be responsible for the family rather than the girl. This study found a slightly lower male/female sex ratio than those found in Algeria and France[14, 15] but was consistent with that found by Robert *et al.* in Kinshasa.[18]

In Africa, childhood cancer is still too often stigmatized due to ignorance of the disease or often late diagnosis and beliefs surrounding the disease. Childhood cancer is often viewed as mystical, and a significant number of households in our community first brought children to traditional practitioners.

In our study, the cancers commonly encountered in our environment were retinoblastoma, which alone accounted for 29 (29.3%), kidney tumours of 23 (23.2%) in the second position, lymphomas and leukaemias of all forms combined had a total of 13 (13.2%) and 12 (12.1%) respectively. Studies in the Congo Brazzaville and Kinshasa have shown a predominance of retinoblastoma (approximately 30%).[10] Looking at the distribution of childhood cancers according to sex in our study, males had retinoblastoma as the most common type of cancer (30.4 %) followed by kidney tumours (17.9%) and lymphomas (14.3%). On the other hand,females, suffered from Kidney tumours (30.2 %), Retinoblastoma (27.9%) and leukaemias (13%). There are cancers associated with factors other than the most incriminated factor in embryonic development by comparing it to developed countries. Other tumours may be related to lifestyle. Nervous system cancers are also relatively less common. This can be explained by a lack of state-of-the-art equipment (brain imaging) in our environment and also by a very small number of qualified personnel for the identification of an early and certain diagnosis. These results are similar to those of other developing countries[19] like Abidjan (Côte d'Ivoire), Niamey (Niger), Ibadan (Nigeria), and Gambia.[15, 20, 21]

The lymphomas prevalent in Lubumbashi are in third place with a significant number of Burkitt lymphomas (8.8 % of NLL), which occupies the 1st rank among the different types of lymphoma. Uwizeye *et al* in Rwanda found that Burkitt's lymphoma was rare in Rwanda.[22] The most common childhood cancers are non-Hodgkin's lymphoma (33.15 %) and nephroblastoma (9.84%).[23] This situation is different from our series. It is probably because in our community the families consulted more for Burkitt than for the case observed in Rwanda.

A good number of children (28.7 %) had received chemotherapy and surgery with a curative aim during the period of our study. We recorded (35.6

%) a number of deaths. These results are almost similar to studies carried out in Africa[20], but stay very different from studies conducted in developed countries where mortality rates for childhood cancers are falling significantly.[23] This could be due to a delay in diagnosis, a lack of qualified personnel for care, a lack of specialized oncology units, and also to the lack of access to care which remains a heavy burden for most households.

Study Limitation

The results of this epidemiological study of cancer in children only include data from children who visited the cancer unit at the University Children's Hospital in Lubumbashi during the period of our study, but do not represent all children with cancer in the community. Future research, including data from the DRC National Registry of Paediatric Cancer will provide a more complete and accurate picture of the burden of this disease in the population and a better understanding of the prevention or delay of morbidity, disability and death.

CONCLUSION

This study established the hospital epidemiological profile of childhood cancer in Lubumbashi. Early diagnosis and early treatment continue to be crucial in reducing mortality among children with these diseases. As the majority of other cases are underdiagnosed, the prevalence reported in this study does not represent all cases of childhood cancer. The mortality rate is still very high and many children have lost sight. The study also highlights the need to properly manage the registration of cases in a specific cancer registry, which is lacking in the DR Congo for good epidemiological monitoring. Detailed research is needed to better understand the epidemiology of cancer in Lubumbashi town.

Abbreviations

CUL Lubumbashi University Clinics

ICCC 3 International Classification of Childhood Cancers 3rd Edition

CRI Crude Incidence Rates

CEM Medical Ethics Committee

UNILU University of Lubumbashi

DRC Democratic Republic of the Congo

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Getting the data and materials

The datasets produced/analysed in this study can be found in the [Epidemiological profile of childhood cancer] repository, [10.6084/m9.figshare.22121360]

Ethics approval and consent to participate

None.

Competing interests

Authors report having no competing interests.But the abstract of this paper was presented at the 55th Congress of the international society of paediatric oncology as a publication topic: AS05SIOP Scientifc Program/AS05.r with interim findings. The poster's abstract was published in "Poster Abstracts" Paediatric Blood & Cancer in the Wiley Online Library :DOI: 10.1002/pbc.30748. **Volume 70, Supplement 8, November 2023.**

Consent for publication

None.

Authors' contributions

All authors read and approved the final manuscript to supervision. CKM, CKD, RLM and MN. study concept and design, CKM, CKD, MN and BKI. data

collection, CKM, DB and CKD. contributed to data analysis, data interpretation, and drafting of the original manuscript, CKM and CKD.contributed to data curation, CKM, DB and CKD. contributed to writing-review and editing, BKI, DMK and OLN. final manuscript for critical revision and approval.

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