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Solid Tumours of Childhood in Sokoto, Nigeria

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***Abstract*—Background:Childhood tumours are known to occur commonly in developing countries and in recent times there have been growing concerns about the incidence and management of these cancers in tropical Africa.We undertook this study to determine the relative frequencies of solid childhood malignancies in Sokoto North-western Nigeria.**

Materials and Methods: Hospital-based data of histological and cytologically confirmed cases of solidmalignancies in children, aged ≤ 15 years, was collated over a period of 10 years. All records of patients with the diagnosis of childhood malignancies were retrieved from histology and cytology register in the Department of Histopathology in the period,January 2006 to December 2015.All histological sections had been stained with haematoxylin and eosin (H&E and the cytological specimens were stained with both Papanicolaou and Giemsa stains. The data were analyzed for age, sex and histological types using SPSS version 20.0 software. The results are presented in form of simple frequency tables using Diagnostic guidelines by the International Classification of Childhood Cancer (ICCC).

Results:A total of 358 children aged 15 years or less, with confirmed malignant disease, was recorded. This constituted 9.1% of all malignancies diagnosed in the same period with a Male: Female ratio of 1.2:1mean age (year) of 7.45.The age range was 0 to 15 years. There were more male cancers (n=196 54.7%) compared to female cancers (n=162, 45.3%).The top five childhood solid malignancies were Rhabdomyosarcoma 112(31.3), Retinoblastoma 62(17.3%), Burkitts lymphoma 45(12.6%), Nephroblastoma 31(8.7%) and Osteosarcoma 19(5.3%).

Conclusion: Rhabdomyosarcoma is the most prevalent solid malignancy of childhood seen in this region and the majority were of the embryonal type,this contrasts with what is observed in developed countries where and neoplasms central nervous system predominate.

Index Terms : Cancer, childhood, Rhabdomyosarcoma , Sokoto

I. INTRODUCTION

The emerging threat of cancers in developing countries, especially in the pediatric age group, has received little attention. This can be explained by the preoccupation with infectious diseases, such as malaria, which contributes to about 25% of the deaths in children under the age of one. However, there are some growing concerns on the incidence and management of childhood cancers in tropical African countries. Childhood cancers comprise just 0.5%-2% of malignancies in the industrialized countries,[1, 2] but 4.3%-12.5% in the developing countries.[3-6] Not surprisingly, over 80% of the global childhood cancers are estimated to occur in the developing countries.[7]

Studies of cancer in children have contributed greatly to the understanding of the genetic processes involved in carcinogenesis as there are peculiarities and variations in the occurrence of specific cancers with respect to age, sex and ethnic origin.It is a truism that cancer is a result of genetic alteration.[1] The age-incidence patterns and cell types of origin for many childhood cancers point to an origin at latest in utero. Chromosome translocations involved in many childhood leukaemias have been shown to originate during foetal haematopoiesis on the basis of studies of monozygotic twins concordant for leukaemia and by detection in neonatal blood spots.[8]

Whereas most adult cancers are carcinomas, childhood cancers are histologically very diverse,[1] it was considered appropriate to undertake this retrospective study, with a view to determining the most common solidmalignancies in children aged 15 years or less, including their age and sex distribution in this environment. This will form a basis for comparison with studies from different parts of the country and other parts of the world. The report may also help relevant institutions focus on the planning of intervention programs.

II. MATERIALS AND METHODS

Hospital-based data of histological and cytologically confirmed cases of solid malignancies in children, aged ≤ 15 years, were collated over a period of 10 years. All records of patients with the diagnosis of childhood malignancies were retrieved from histology and cytology register in the Department of Histopathology in the period between January 2006 to December 2015.All histological sections had been stained with H and E and the cytological specimens were stained with both Papanicolaou and Giemsa stain. The data were analyzed for age, sex and histological types using SPSS version 20.0 software. The results are presented in form of simple frequency tables, International Classification of Childhood Cancer (ICCC).

INCLUSION/EXCLUSION CRITERIA: All histotolgically confirmed solid cancers were included while non-confirmed cancers were excluded. Non solid cancers like leaukaemia were also excluded from this study.Similarly,cases in which tissue blocks or achived cytologic stained smeared slide were missing were also excluded.

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III. RESULT

A total of 3933 malignancies were diagnosed over the 10-year period (2006 – 2016) and of these, 358 cases were in children ≤ 15 years, constituting 9.1% of all the cases. Using the criteria laid down ICCC, the malignancies seen over this period were classified and depicted in Table1. This shows the sex distribution of all cancers diagnosed during the periodwith a Male : Female ratio of 1.2 :1.Table 2 shows the age and sex distribution of the top 5 cancers documented in the study. The top five childhood malignancies found in this study by histologic type were Rhabdomyosarcoma 112(31.3), Retinoblastoma 62(17.3%), Burkitts lymphoma 45(12.6%), Nephroblastoma 31(8.7%) and Osteosarcoma19(5.3%). Table 4 indicates the frequency and gender variation of the top 5 malignancies by site. The highest frequency were soft tissue with 38 females and 54 males giving a total of 92(25.7%) followed by eye with 28 females and 35 males with a total of 63(17.6%).

Table 1 – Incidence and Sex Distribution of Malignancies Recorded in the Study Period

S.N	HISTOLOGICAL TYPES	FEMALE	MALE	TOTAL	%
1	RHABDOMYOSARCOMA	57	55	112	31.3
2	RETINOBLASTOMA	29	33	62	17.3
3	BURKITTS LYMPHOMA	19	26	45	12.6
4	NEPHROBLASTOMA	14	17	31	8.7
5	OSTEOSARCOMA	9	10	19	5.3
6	MATASTATIC CARCINOMA	4	8	12	3.4
7	SQUAMOUS CELL CARCINOMA	7	5	12	3.4
8	MUCINOUS ADENOCARCINOMA	3	6	9	2.5
9	MEDULLOBLASTOMA	3	5	8	2.2
10	NEUROBLASTOMA	1	6	7	2
11	DSYGERMINOMA	5	0	5	1.4
12	HODGKIN LYMPHOMA	0	4	4	1.1
13	IMMATURE TERATOMA	1	3	4	1.1
14	KAPOSIS SARCOMA	1	3	4	1.1
15	MALIGNANT PPERIPHERAL NERVE SHEARTH TUMOR	2	2	4	1.1
16	BASAL CELL CARCINOMA	2	1	3	0.8
17	YOLK SAC TUMOR	0	3	3	0.8
18	DERMATOFIBROSARCOMA PROTUBERANCE	2	0	2	0.6
19	HEMANGIONBLASTOMA	0	2	2	0.6
20	HEPATOBLASTOMA	1	1	2	0.6
21	MALIGNANT MELANOMA	0	2	2	0.6
22	NASOPHARYNGEAL CARCINOMA	1	1	2	0.6
23	CARCINOMA(NOS)	0	1	1	0.3
24	EWING SARCOMA	0	1	1	0.3
25	GRANULOSA CELL TUMOUR	0	1	1	0.3
26	MALIGNANT SKIN ADNEXAL TUMOUR	1	0	1	0.3
	TOTAL	162	196	358	100

Table 2 – Age Distribution of the Top 5 Malignancies In The Study Period

AGE	0 -5		6 -10		11 -15		
HISTOLOGICAL TYPES	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	TOTAL
RHABDOMYOSARCOMA	18	18	25	30	14	7	112
RETINOBLASTOMA	20	21	6	10	3	2	62
BURKITTS' LYMPHOMA	3	6	10	14	6	6	45
NEPHROBLASTOMA	8	9	6	8	-	-	31
OSTEOSARCOMA	-	-	2	4	7	6	19

Table 3 – Comparison of Top 5 Malignancies with Studies from other Parts of the Country

HISTOLOGICAL TYPES	**FREQUENCY(%)**	**RANK**						
		STUDY AREA	**ZARIA[a]**	**KANO[b]**	**JOS[c]**	**SAGAMU[d]**	**ILORIN[e]**	***P/H[f]**
RHABDOMYOSARCOMA	112 (31.3)	1	5	4	1	7	**8**	**3**
RETINOBLASTOMA	62 (17.3)	2	1	1	4	3	**3**	**4**
BURKITTS LYMPHOMA	45 (12.6)	3	2	2	3	1	**1**	**1**
NEPHROBLASTOMA	31 (8.7)	4	4	5	5	4	**2**	**2**
OSTEOSARCOMA	19 (5.3)	5	13	13	8	6	**4**	**9**

* P/H – Port Harcourt; Data was obtained from the following sources,[a] Ahmed *et al.*[13];[b]Ochicha et al[11];[c]Naánlep*et al.*[12];[d]Agboola*et al.*[23];[e]Omotayo*et al.*[22]; [f]Seleye-Fubara*et al.*[14]

Table 4 – Top 5 Malignancies According To Site of Diagnosis

S/N	ORGAN	FEMALE	MALE	TOTAL	(%)
1	SOFT TISSUE	38	54	92	25.7
2	EYE	28	35	63	17.6
3	KIDNEY	14	14	28	7.8
4	LYMPH NODE	4	11	15	4.2
5	OVARY	11	0	11	3.1

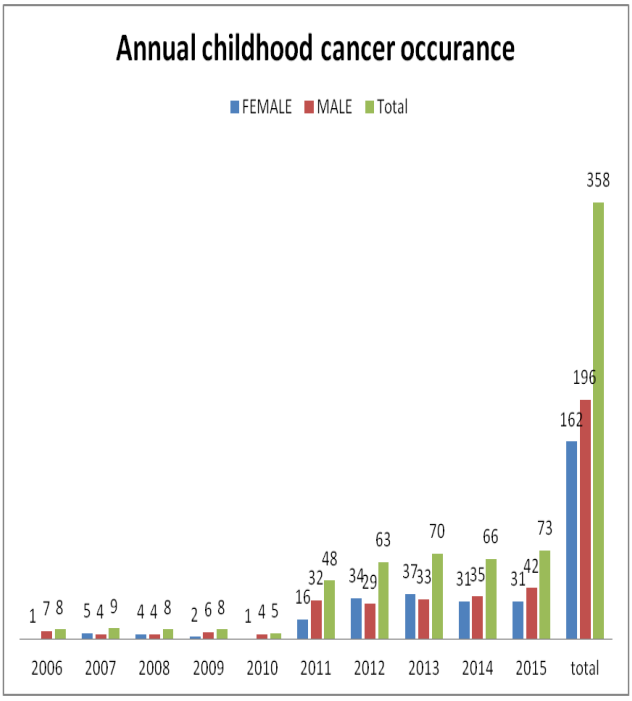

Figure 1 – Annual childhood cancer prevalence according to year of diagnosis

IV.DISCUSSION

Our Findings showed that there was a steady annual increase in the prevalence of solid childhood tumours.

From the figure above, it can be inferenced that the incidence of childhood solid tumours is increasing. Linetet al.[9]analyzed incidence data on childhood cancer, diagnosed during the period 1975–1995, from 9 registries contributing to the United States Surveillance, Epidemiology, and End Results (SEER) Program, they observed similar rise in prevalence and concluded that the increase was due to diagnostic improvement s or reporting changes. The decline in 2014 and the subsequent rise in 2015 as per Figure 1 tends to sway our decision towards that of McNally et al.[10] who contended that the rising incidence is real and independent of any diagnostic change.

Childhood malignancies though rare in developed countries [1,2] poses a real concern in developing countries. We recorded an incidence rate of 9.1% for malignancies of childhood during our study period. This is almost 10 times the incidence seen in the United States [7]. It was slightly lower than the incidence recorded in Kano (10.9%) located in North-western Nigeria[11], , Jos (10%) located in central Nigeria[12] and Zaria (11.2%) also in North-western Nigeria[13],However, these figures are slightly higher than the incidence recorded in Port Harcourt (8.2%) Southern Nigeria[14] and Lagos, South-western Nigeria[15]. By and large, overall,the findings are comparable to data obtained in other regions of Nigeria.There was a slightly higher preponderance of males to solid childhood cancers than females. The ratio of males to females recorded in our findings was 1.2 : 1. This was similar to findings recorded in other parts of Nigeria[10-16] and other parts of the world.[7, 17-19] On the other hand, Brazil, Malawi, Uganda and Zimbabwe sowed a higher preponderance of females to males among developing countries.[20]

The top five solidchildhood malignancies found in this study by histologic type are Rhabdomyosarcoma 112(31.3), Retinoblastoma 62(17.3%), Burkitts lymphoma 45(12.6%), Nephroblastoma 31(8.7%) and Osteosarcoma account for 19(5.3%). Their incidence varies widely with data obtained from Kano[11] and Zaria [13] even though they share similar climatic and environmental conditions;s this also extend to other parts of the Nigeria.[14-16, 22-23]Studies in Kano and Zaria showed retinoblastoma as the highest childhood malignancy followed by Burkitts lymphoma.

The relatively high proportion of retinoblastoma in these two northern Nigerian cities of Zaria and Kano may partly be attributable to the fact that thepathology laboratories of both teaching hospitals, where the studies were carried out, also serves major eye specialist referral centres in Kano and Kaduna, Nigeria. High rates of retinoblastoma have also been documented in other African countries with this ophthalmic tumour among the top 3 childhood cancers in Tanzania,[24] Ghana,[25]Kenya,[17] Malawi,[26] Congo[27] and other parts of Nigeria.[15]

In the Southern parts of the country, Burkitts lymphoma was the highest childhood malignancy recorded.[14, 22-23] This finding may be as a result of the geographical distribution of BurkittsLymphoma. Dennis Burkitt, who defined this childhood malignancy, observed that the lymphoma is largely confined to areas with annual rainfall of more than50.8 cm and temperature consistently above 15.5˚C.[28]These climatic factors favour mosquito transmission of malaria, which is a known risk factor for endemicBurkitt lymphoma. Sahelian northern Nigeria is much dryer than the south region with substantially lower annual rainfall, and during the dry harmattan season, temperatures can drop precipitously to 15.5˚C.

Previous findings inthe centre in 2005 showed Burkitts lymphoma as the highest childhood malignancy followed by

retinoblastoma.[29] This has now been overtaken by rhabdomyosarcoma which was similar to findings documented in Jos, Nigeria.[12]The most frequent soft tissue sarcoma of childhood in the world is rhabdomyosarcoma with a peak age of less than 5 years. This was similar to our findings but at variance to data observed by Omotayo et al.[22]

Brain tumours the second most common cancer in western countries [1,2] is on the rise and was ranked 9th in the incidence for this centre. The rise compared to other regions may be due to the recent utilization of the centre for Neurosurgery in the UsmanuDanfodiyo University Teaching Hospital, Sokoto. Of concern, also is the rise in incidence of osteosarcoma which is not even in the list of top 5 cancers in most literatures consulted (See table 3). Several authors have established a link between fluoride in drinking water during growth and development and osteosarcoma.[30-32] Another documented risk factor for osteosarcoma is radiation dose.[33]

The dramatic advances that have been made in the treatment of childhood cancer over the past several decades have created large and growing population of long-term survivors.[34]Although many childhood cancers now can be cured, the aggressive therapies used are associated with increased risks of a variety of adverse health effects, including new primary cancers.[35-38] Majority of the 2nd cancers were solid tumours and the likelihood of developing such cancers is six fold compared to the general population.[39] However, the likelihood is further increased with exposure to radiotherapy in the treatment of the first cancers.[39] Therefore, surveillance is necessary for survivors of childhood tumours as obtainable from statistical evidence.

V.CONCLUSION

Rhabdomyosarcoma was the most prevalent solid malignancy of childhood seen in this region and the majority were of the embryonal type, in contrast to the predominant leukemic and central nervous system trend seen in developed nations.

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