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Original Research Article

Pattern of solid tumors of infancy and childhood among sample of patients attending tertiary teaching hospitals in Baghdad

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ABSTRACT

Background: Solid tumors are most common cause of death in the first fifteen years. In developed countries cancer is the leading cause of death from disease in children more than six month of age. The aim of this study was to assess: the relative frequency of the childhood tumor, the distribution of solid tumors of childhood in relation to age, sex of the patient, and histological types of the tumors over period (1992 -2015).
Methods: Two thousand four hundreds and three cases of solid tumors of infancy and childhood has been studiedfor period from (1992-2015), 170 was a prospective cases where 2233 cases a retrospective. The study was carried out through histopathological examination of biopsies of patients attending major medical centres in Baghdad, Iraq.
Results: Malignant neoplasms in descending order of frequency were, lymphoma (29.5%), central nervous system tumors (24.5%), soft tissue tumors (9.4%), Neuroblastoma (9.1%), wilms' tumors, (7.4%), Bone tumors, (7.3%), Retinoblastoma (5.1%), Germ cell tumors, (3.5%), Liver tumors (0.2%), others (4.6). Males were more frequently affected with central nervous tumors (59.6%), Malignant lymphoma (69.5%), neuroblastoma (62%), Soft tissue tumors (60.3%), nephroblastoma (51.5%), retinoblastma (58.8%), liver tumor 81 and other miscellaneous tumors (59.6%) while females were more frequently effected with germ cell tumors 70.5% and bone tumors (53.9%). Central nervous system tumors reach a peak between (5-9) years whereas neuroblastoma, nephroblastoma, retinoblastoma germ cell tumors, liver tumors reach a peak between (0-4) years and malignant lymphoma, bone tumors and other – Miscellaneous – tumors reach a peak between (10-15)years. Non Hodgkins lymphoma were the predominating lymphoma (62%), astrocytoma formed the majority of central nervous system tumors (44.6%) While rhabdomyosarcoma was the commonest histologic subtype of soft tissue tumors (76%) Ewing's sarcoma was the commonest type of bone tumors (56%).
Conclusions: A steady increase in the incidence rate of childhood tumors is noticed with a change in pattern from malignant lymphoma to CNS. tumors in the study period. A diagnostically important relationship exists between a particular type of pediatric tumors with age, sex and site.

Keywords: Baghdad, Childhood, Infancy, Solid tumor

INTRODUCTION

The most common cause of death in the first fifteen years are solid tumors and preceded only by accidents. Worldwide approximately 200000 cases occur annually. In developed countries cancer is the leading cause of death from disease in children more than six month of age.[1]

In the USA more than 7000 new cases of cancer are diagnosed in children under 15 years of age each year. Approximately one third of those children ultimately die from disease or from the side effect of therapy. Cancer in children is rare with only about 1200 new cases in England each year. The overall annual incidence of cancer in England is 107 per million children.[2]

In general, the features of malignancies in children differ biologically and histologically from those of adults with respect to incidence, type of tumor, underlying familial or genetic aberration and tendency to regress spontaneously or cytodifferantiate.[3]

Two-thirds of the neonatal tumors are diagnosed in the first week of life, comprising 2% of childhood malignancies. Infantile solid tumors account for 10% of malignancies seen in children. Neuroblastoma (NB), Wilm's tumor (WT), teratoma and soft tissue sarcomas (STS) rank amongst the most common tumors in neonates and infants. Other tumors include hepatoblastoma, Central Nervous System neoplasms and retinoblastoma.[4]

Information regarding timing of presentation and diagnosis as well as outcome especially amongst neonates is limited owing to rarity of cases. The goal of the article is to audit the demographics and outcome in infants with solid tumors treated in a tertiary care pediatric hospital in Baghdad.

METHODS

Cases of solid tumor of infancy and childhood were obtained from histopathology records at the following teaching and private laboratories in a retrospective and prospective study for the period (1992- 2015 included):

- Medical City Teaching Labs,
- Public Health Central Lab,
- Specialized Surgical Hospital,
- Imamein Kadhimein Medical City,
- Neuro Surgical Hospital,
- Iraqi cancer registry.

The request forms and histopathological reports were reviewed for clinical information and histopathological diagnosis. Reviewing the original patient's records were done in certain cases.

H. and E. stained sections were obtained when available and new sections were made from paraffin blocks for unavailable cases.

Microscopical review of tissue sections was done, the following histological criteria were assessed; histological type of the tumor, cellular details including shape, size, nuclear atypia, nucleolus, mitosis and cytoplasmic appearance presence of capsule, capsular invasion, vascular invasion, appearance of surrounding tissue, cystic degeneration, inflammatory cell infiltration, true and pseudorosettes, calcification, fibrosis and necrosis. Cases were classified into the following groups:

- Central nervous system tumors.
- Malignant lymphoma
- Neuroblastoma
- Renal tumors
- Soft tissue tumors
- Germ cell tumors
- Bone tumors.
- Liver tumors
- Retinoblastoma
- Others.

Each group was studied separately to determine the overall frequency, age distribution, sex distribution, location and the predominant microscopical types.

Statistical analysis was done using SPSS Statistical package for social science version 10 system. The statistical significance of association between diagnosis categories and the study period, age group, sex, location and clinical presentation was tested with chi- square test (P value $\leq$ 0.05 was the adopted level of significance) ultimately the results were compared with other Iraqi and abroad studies.

RESULTS

Annual distribution and relative frequency of childhood tumors

A total of 4003 cases of childhood tumors were collected and studied, 170 were a prospective case whereas 3833 cases were retrospective for period from (1992- 2015). There was a gradual increase in the number of cases over the study period

The annual distribution, time trend and relative frequency of childhood tumors are shown in Table 1.

Histological types of childhood tumor

Central nervous system tumors

Astrocytoma was the commonest type comprises 44.6% followed by Primitive neuroectodermal nerves sheath tumor (PENT) constitute 23.1% Table 3.

Malignant Lymphoma

study pediatric malignant lymphoma are the most common malignant tumors, they account for 28.5% of childhood tumors.

The distribution of various types of lymphoma is shown in Table 4.

Table 1: The annual distribution and relative frequency of childhood tumors.

Years	CNS tumor	Lymphoma	Neuro-blastoma	Soft tissue tumor	Nephro-blastoma	Bone Tumors	Retino-blastoma	Germ cell tumor	Liver tumor	Others	Total
1992	30	53	10	8	10	7	3	4	0	4	129
1993	20	50	8	6	7	5	2	2	0	3	103
1994	8	61	13	13	15	13	4	5	1	5	138
1995	8	55	12	15	10	12	3	5	0	3	123
1996	14	46	17	12	12	11	4	4	0	5	125
1997	18	54	12	13	16	10	5	6	1	5	140
1998	25	48	13	10	8	10	6	6	0	7	133
1999	22	51	15	13	16	15	4	3	0	7	146
2000	40	46	22	8	12	8	1	7	0	6	150
2001	29	55	12	12	11	8	3	4	1	10	145
2002	38	45	11	15	10	12	6	7	1	12	157
2003	20	40	11	8	7	12	6	6	0	2	112
2004	33	45	13	11	15	16	6	8	2	6	155
2005	38	54	15	12	8	12	8	6	0	7	160
2006	40	58	16	16	13	12	8	8	0	7	178
2007	50	56	18	20	14	12	10	7	1	9	197
2008	79	48	16	26	18	15	16	6	2	11	237
2009	63	40	20	23	11	12	12	5	0	8	194
2010	64	38	16	19	15	13	15	7	1	11	199
2011	66	40	18	21	16	15	16	9	0	10	211
2012	71	48	20	25	14	17	18	6	1	12	232
2013	73	41	19	26	15	20	14	8	0	13	229
2014	74	39	25	30	14	18	18	8	0	14	240
2015	59	30	12	16	10	8	16	5	0	14	170
Total	982	1141	364	378	297	293	204	142	11	191	4003

Table 2: Sex and age distribution of the histologically diagnosed childhood tumor.

Diagnosis	No.	%	M	F	M:F	Mean	S.D	Range
CNS tumors	982	24.5	586	396	1.5:1	8.2 yr.	4	1-15 yr.
Lymphoma	1141	28.5	793	348	2.3:1	7yr	4	1-15 yr.
Neuroblastoma	364	9	226	138	1.6:1	33 m	2.8	2m-12 yr.
Soft tissue tumors	378	9.4	228	150	1.5:1	4.5 yr.	4.1	7m-15 yr.
Wlims' tumors	297	7.4	153	144	1.1:1	3.8 yr.	2.9	8m-13 yr.
Bone tumors	293	7.3	135	158	1:1.2	11 yr.	2.8	4-15 yr.
Retinoblastma	204	5	120	84	1.4:1	3.1 yr.	1.8	6m-8 yr.
Germ cell tumor	142	3.5	42	100	1:2.4	4 yr.	3.9	15day-15 yr.
Liver tumors	11	0.2	9	2	4.2:1	4 m	0.5	20day-2 yr.
Others	191	4.6	117	74	1.5:1	8 yr.	4	10m-15

Non-Hodgkin's lymphoma

Burkitte lymphoma was the most common type comprises 61%. Table 4 shows the male to female ratio is 2.2-1 and the peak age is between 0-4 years.

Hodgkin's lymphoma

Mixed cellularity was the most common type followed by lymphocytic depletion table (4) the male to female ratio is 2.3-1 and the peak age between 10 - 15 years.

Soft tissue tumors and bone tumors

Malignant soft tissue tumors forming 9.4 % of all childhood cancer. Rhabdomyosarcoma was the most commone of soft tissue sarcoma while non rhabdomysarcoma representing 24% table.

Malignant bone tumors constitute 7.3% of all malignant cases Ewing's sarcoma was the commonest type 166 cases were reviewed representing 56% of bone tumor followed by Osteogenic sarcoma 41% Table 5.

Table 3: The distribution of central nervous system tumors.

Diagnosis	No.	%
Astrocytic tumors	438	44.6
PENT	227	23.1
Craniophargioma	76	7.7
Oligodendroglial tumors	27	2.7
Ependymal tumors	42	4.3
Meningothelial cell tumors	11	1.1
Pineal body tumors	5	0.5
Others	156	15.8
Total	982	100%

Table 4: The distribution of childhood malignant lymphoma.

Diagnosis	No.	%
NHL	727	63
Low grade – Small Lymphoplasmocytic (Mediterranean)	42	5.5
Intermediate grade (mixed small, large)	29	3.7
High grade		
large cell – lymphoblastic	123	17
Burkitt"s	343	61
Non Burkitt"s	58	8
Histiocytic	34	4.7
HL	414	37
Mixed cellularity	236	57
Lymphocyte depletion	112	27.5
Nodular sclerosis	44	10.5
Lymphocyte predominant	22	5

Table 5: The frequency of childhood soft tissue tumors.

Soft tissue tumors	No.	%
Rhabdomyosarcoma	291	76
Non-rhabdomyosarcoma	87	24
Total	378	100
Bone tumors		
Ewing's sarcoma	166	56
Osteogenic sarcoma	123	41
Other	14	3
Total	293	100

Germ cell tumors

The majority were extragonadal tumor with a midline location (62%), while gonadal location representing 38% of all germ cell tumors Table 6.

Retinoblastoma

Retinoblastoma is a relatively rare tumor in children although it is the most common intraocular neoplasm of pediatric age group observed (11). It constitutes 5.1%, male to female ratio 1.4:1, the mean age 3 years

Liver tumors

Primary tumors of the liver account for approximately 1% of malignancies in children. More than 65% of these malignant tumors are hepatoblastoma. In our study eleven cases were reviewed representing 0.2% of childhood tumors all of them are hepatoblastoma

Table 6: The distribution of childhood germ cell tumors.

Diagnosis	No	%
Extragonadal	89	62
Sacrococcygeal	62	43
Mediastinal	15	10.5
Retroperitoneal	12	8.5
Gonadal	53	38
Ovary	36	25.1
Tests	17	12.9

Others-Miscellaneous

191 cases were reviewed representing 4.6% of childhood tumor. The male to female ratio 1.4:1. The mean age 8 years. These include 121 cases unspecified, 2 patient's salivary gland carcinoma, 3 patient's colonic adenocarcinoma, 1 patient suprarenal carcinoma, 26 patients skin carcinoma, 30 patients histocytosis tumors. Salivary gland carcinoma, colonic gastric carcinoma, nasopharyngeal carcinomas, histiocytosis tumor.

DISCUSSION

In this study we notice that there is a steady increase in the frequency of childhood tumors in general with a change in the pattern of the predominant tumor from malignant lymphoma to central nervous system tumors, this may be related to overall increase in the incidence of malignancy (particularly haematolymphoid malignancies) in Iraq over the last decade and may also be related to other factors such as[5]

Environmental changes, radiation exposure, chemical agents, contamination and the state of secondary immunodeficiency, which is due to the embargo imposed on our country from 1992-2015.

Malignant lymphoma

In our study pediatric malignant lymphoma are the most common malignant tumors, they account for 28.5% of childhood tumors.

Non – Hodgkin's lymphomas

These are more common than Hodgkin's disease in a ratio of 1.6:1. This is unlike the distribution observed in the West where Hodgkin's disease to non- Hodgkin lymphoma shows a ratio of 44:56.[6] This difference is

most probably due to high incidence of extranodal lymphomas in our country with a particular prevalence of intestinal-involvement-by-the-non-endemic-Burkitt's-types. when classified according to the working formulation of the National Cancer Institute, the result of this study show predominance of Burkitt's lymphoma (62%) followed by the lymphoblastic type (17%), (a ratio of 3.6:1) this is comparable to other Iraqi studies by AL-Irhayim and Saleem 3:1.[7,8]

Hodgkin's lymphoma

In the United State and the Northern Europe, Hodgkin's lymphoma is rare before the age of the 5 years with a gradual rise in incidence with age until adolescence.[9]

In our study the peak number of the observed cases predominant in the years 10-15 age group, this is agreement with previous Iraqi results by AL-Irhayim and Saleem.[8] Mixed cellularity subtype was the predominant type and this is comparable to previous Iraqi result by Ibrahim and Alash.[9,10]

Central nervous system

Brain tumors are the most prevalent solid tumors occurring in pediatric age group in the West in our study it is observed that the CNS tumor is the major type of cancer in this study followed by lymphomas.[11]

The CNS tumors constitute 24.5% of malignant childhood tumors and were most common in 4-9 years age group and there is a male to female ratio 1.2;1 which is similar to the previous Iraqi studies by Ibrahim and Alash.[11]

Astrocytoma was the commonest central nervous system tumors, it constitute 44% and followed by PENT.

Neuroblastoma

Neuroblastoma form 9% of all malignant cases in this study, it is the most common extracranial solid tumors affect young children of both sexes.

Eighty percent of the affected children are under 4 years of age and this is closely similar to the result of this study in which 72% are under 4 years of age.[12]

Soft tissue tumors

Malignant soft tissue tumors were the third in ranking order after malignant lymphoma and central nervous system tumors forming 9.4 % of all childhood cancer. The tumors are mostly detected in the first age group.

Rhabdomyosarcoma was the commonest type representing 76% followed by non-rhabdomyosarcoma, this is in contrast to that reported by Ibrahim and Alash.[9]

Wilms' tumors

Wilms' tumor is the most primary renal neoplasm of childhood (Ninety percent of cases are less than 6 years of age and 8% less than 10 years of age. In our study 76% of cases are less than 4 years of age and 8% less than 10 years of age. In some literatures there is no striking sex predilection but, in our series, there was slight male predilection 1.5;1 this is in contrast with Al-Badrii and Al Hadithy were male to female ratio 1;1.4.[13]

Bone tumors Malignant bone tumors constitute 7.3% of all malignant cases, most of cases were encountered in the third childhood period, this is in agreement to a study done by Ibrahim and Alash.[9] An interesting finding in our study was a slight female preponderance 1; 1.2, this more or less similar to the study done by Ibrahim and Al ash while in the well documented features of these tumors there is predominance of Osteogenic sarcoma tumor in the male while Ewing's Sarcoma affects both sex equally.[9,13]

Germ cell tumors

A female preponderance was noted. The majorities were extragonadal 62% with a midline location. These data are highly compatible with other studies.

Retinoblastoma

Retinoblastoma is a relatively rare tumor in children although it is the most common intraocular neoplasm of pediatric age group observed.[13] It constitutes 5.1%, male to female ratio 1.4:1, the mean age 3 years this is closely similar to Al-Hashimi et al.[14] An increase in the incidence rate was observed may be due to genetic mutation caused by environmental factors, radiation level, and exposure to chemicals.[14]

Liver tumors

Primary tumors of the liver account for approximately 1% of malignancies in children. More than 65% of these malignant tumors are hepatoblastoma. In our study eleven cases were reviewed representing 0.2% of childhood tumors all of them are hepatoblastoma.[15]

Other-Miscellaneous - Tumors

The total number of these cases is 191 representing 4.6% of childhood tumor 121 cases were un specified among 70 cases 4 cases of them are colonic carcinoma 26 cases with skin carcinoma, 26 cases nasopharyngeal carcinoma, 14 cases histiocytosis X tumor.

Only four cases of colonic carcinoma were reported. in some cases in which children subjected to irritants during their life, the duration of exposure may be very short to predispose to malignancies. 26 cases of nasopharyngeal carcinoma were encountered this tumor is uncommon in

children a counting for 1-2 % of childhood malignancies, the peak age incidence is between 10 and 15 years with male to female ratio of (2:1).[16] 14 cases with histiocytosis tumor and this tumor is regarded one of the malignant tumor that affect children.[17]

CONCLUSION

We concluded that there is a steady increase in the incidence rate of childhood tumors in the study period with a change in pattern from malignant lymphoma to CNS tumors. A diagnostically important relationship exists between a particular type of pediatric tumor with age, sex and site.

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