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MALIGNANT SOLID TUMORS IN CHILDREN IN THE REGION OF FEZ (MOROCCO): EPIDEMIOLOGICAL AND HISTOPATHOLOGICAL PROFILE

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ABSTRACT

Introduction: Pediatric cancer is rare and accounts for only 1 to 3% of all malignancies. In general, it is dominated by leukemia. In the region of Fez, there is no available data concerning malignancies in children.
Materials and Methods: This study includes, except leukemia, all other pediatric malignant neoplasms diagnosed in patients less than 15 years, from 2006 to 2016. It was conducted at the department of pathology of the Hassan II university hospital, Fez, Morocco. The characteristics of patients, including age, sex, location, and histological diagnosis were analyzed.
Results: During a period of 11 years, 556 cases were recorded. There was a male predominance with a sex ratio of 1.3. Age varied between 2 months and 14 years with a mean age of 7.02 years. 37.6% of cases were diagnosed in the 0-4 years age group, 27.7% in the 5-9 years age group and 34.7% in the 10-14 years age group. The most frequent diagnosis was lymphoma and reticulo-endothelial neoplasm (35%), followed by neuroblastomas and other peripheral nervous cell tumors (11.8%).
Conclusion: This study may reflect demographical and histopathological characteristics of pediatric malignancies in the region of Fez, Morocco. It revealed a male predominance and a high frequency of lymphomas. Central nervous system tumors were however less frequent and epithelial tumors more frequent in comparison with other series of developed countries. Other larger studies are necessary to establish a regional and even a national register of pediatric cancer.

Keywords: Cancer; Children; Epidemiology; Histopathology, Morocco; Solid tumors.

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INTRODUCTION

Pediatric cancer is rare and accounts for only 1 to 3% of all malignancies [1; 2]. However, it represents the second cause of child mortality in developed countries after road accidents [3]. The age-standardized annual incidence usually ranges between 70 and 160 per million at age 0-14 years. [4] In general, childhood cancers are dominated by leukemia [5-7]. Greater variation is seen between populations for some specific tumors types [8]. All cancers are considered to be solid malignant tumors, except leukemia [1; 2].

In the region of Fez, there is no register of cancer or available data concerning malignancies in children. For this reason, it was necessary to perform this review of all pediatric solid malignant neoplasm diagnosed in the department of pathology, Hassan II university hospital, Fez, Morocco, which receives the majority of tumors in this region. This study may then reflect regional frequency, demographic and histopathological data of these tumors.

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MATERIALS AND METHODS

This study includes, except leukemia, all other pediatric malignant neoplasms diagnosed in patients less than 15 years, from 2006 to 2016. It was conducted at the department of pathology of the Hassan II university hospital, Fez, Morocco. Data were obtained from patient records and histopathological reports. Diagnosis was based on histopathological examination followed, when necessary, by immunohistochemistry and fluorescent in situ hybridization.

The characteristics of patients, including age, sex, location, and histological diagnosis were analyzed. Age was expressed as mean and range and was stratified into three groups: 0-4 years, 5-9 years and 10-14years. Sex was expressed by percentage and sex ratio. Tumors were classified according to the International Classification of Childhood Cancer (ICCC) [9] which is based on tumor morphology and primary site with an emphasis on morphology. They were divided into 11 groups: lymphomas and reticuloendothelial neoplasms ; central nervous system (CNS) and miscellaneous intracranial and intra-spinal neoplasms; neuroblastoma and other peripheral nervous cell tumors; retinoblastoma; renal tumors; hepatic tumors; malignant bone tumors; soft tissue and other extra-osseous sarcomas; germ cell tumors, trophoblastic tumors, and neoplasms of gonads; other malignant epithelial neoplasms and malignant melanomas; and other and unspecified malignant neoplasms. Distribution of the different histological types was analysed according to age and sex.

Statistical analysis was performed using Epi-Info7 version 7.1.0.6.

RESULTS

During a period of 11 years, 556 cases were recorded. They included 322 boys and 234 girls (57.9% and 42.1% respectively), with a sex ratio of 1.3. Age varied between 2 months and 14 years with a mean age of 7.02 years. 37.6% of cases were diagnosed in the 0-4 years age group, 27.7% in the 5-9 years age group and 34.7% in the 10-14 years age group. Age repartition by groups is presented in **figure 1**.

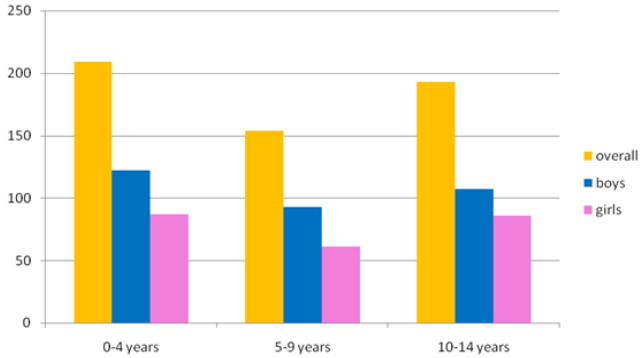

Figure I: Distribution of tumors by age and gender

The most frequent diagnosis were lymphomas and reticuloendothelial neoplasms (35%), followed by neuroblastomas and other peripheral nervous cell tumors (11.8%), malignant epithelial neoplasms and malignant melanomas (9.5%), CNS and miscellaneous intracranial and intra-spinal neoplasms (9.2%), soft tissue and other extra-osseous sarcomas (9%), malignant bone tumors, renal tumors, retinoblastoma, germ cell tumors, trophoblastic tumors, and neoplasms of gonads, hepatic tumors, and others. details are provided in **table I**.

Table I: Histological type distribution according to age and gender.

Histological types	Total n (%)	0-4 y n (%)	5-9 y n (%)	10-14 y n (%)	Male n (%)	Female n (%)	Sex ratio M/F
Lymphomas and reticuloendothelial neoplasms	**189 (33.9)**	**46 (22)**	**70 (45.5)**	**73 (37.9)**	**119 (37)**	**70 (29.9)**	**1.7**
Hodgkin lymphomas	72	5	27	40	41	31	1.3
Non-Hodgkin lymphomas (except Burkitt lymphoma)	40	13	12	15	25	15	1.6
-Precursor cell lymphomas	-18	-9	-6	-3	-18	-0	- NA
-Mature B-cell lymphomas (except Burkitt lymphoma)	-4	-3	-1	-0	-0	-4	-NA
-Mature T-cell and NK-cell lymphomas	-5	-1	-0	-4	-1	-4	-NA
-Non-Hodgkin lymphomas, NOS	-13	-0	-5	-8	-6	-7	-0.8
Burkitt lymphoma	66	19	29	18	46	20	2.3
Miscellaneous lymphoreticular neoplasms	9	9	0	0	5	4	NA
Unspecified lymphomas	2	0	2	0	2	0	NA

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CNS and miscellaneous intracranial and intraspinal neoplasm	**51 (9.1)**	**13 (6.2)**	**20 (13)**	**18 (9.4)**	**30 (9.3)**	**21 (9)**	**1.4**
-Ependymomas and choroid plexus tumor	7	4	1	2	6	1	NA
-Ependymomas	-6	-3	-1	-2	-5	-1	-NA
-Choroid plexus tumor	-1	-1	-0	-0	-1	-0	-NA
-Astrocytomas	7	0	3	4	4	3	NA
-Intracranial and intra-spinal embryonal tumors	33	8	16	9	17	16	1
-Medulloblastomas	-31	-7	-16	-8	-16	-15	-1
-PNET	-2	-1	-0	-1	-1	-1	-NA
Other gliomas	3	0	0	3	3	0	NA
-Oligodendrogliomas	-2	-0	-0	-2	-2	-0	-NA
-Mixed and unspecified gliomas	-1	-0	-0	-1	-1	-0	-NA
Other specified intracranial and intraspinal neoplasms	1	1	0	0	0	1	NA
-Pineal parenchymal tumors	1	1	0	0	0	1	NA
Neuroblastoma and other peripheral nervous cell tumors	**66(11.8)**	**50 (24)**	**13 (8.5)**	**3 (1.5)**	**35 (10.9)**	**31 (13.3)**	**1.1**
Neuroblastoma and ganglioneuroblastoma	66	50	13	3	35	31	1.1
Retinoblastoma	**27 (4.8)**	**23 (11)**	**3 (2)**	**1 (0.5)**	**17 (5.3)**	**10 (4.3)**	**1.7**
Renal tumors	**44 (7.9)**	**31 (14.8)**	**11 (7.1)**	**2 (1)**	**18 (5.6)**	**26 (11.1)**	**0.7**
Nephroblastoma and other non epithelial renal tumors	44	31	11	2	18	26	0.7
-Nephroblastoma	-40	-28	-11	-1	-16	-24	-0.6
-Rhabdoid renal tumor	-1	-1	-0	-0	-1	-0	-NA
-Kidney sarcomas	-2	-2	-0	-0	-1	-1	-NA
-pPNET of kidney	-1	-0	-0	-1	-0	-1	-NA
Hepatic tumors	**10 (1.8)**	**8 (3.8)**	**1 (0.6)**	**1 (0.5)**	**4 (1.2)**	**6 (2.5)**	**0.6**
Hepatoblastoma	9	8	1	0	3	6	-NA
Hepatic carcinomas	1	0	0	1	1	0	-NA
Malignant bone tumors	**46 (8.2)**	**3 (1.4)**	**4 (2.6)**	**39 (20.2)**	**21 (6.5)**	**25 (10.7)**	**0.8**
Osteosarcomas	31	3	3	25	13	18	0.7
Ewing tumor and related sarcomas of bone	15	0	1	14	8	7	1.1
Soft tissue and other extra-osseous sarcomas	**50 (9)**	**17 (8.1)**	**14 (9.1)**	**19 (9.8)**	**35 (10.9)**	**15 (6.4)**	**2.3**
Rhabdomyosarcomas	26	13	6	7	20	6	3.3
Fibrosarcomas, peripheral nerve sheath tumors, and other fibrous neoplasms	3	0	0	3	1	2	NA
-Fibroblastic and myofibroblastic tumors	-1	-0	-0	-1	-1	-0	-NA
-Nerve sheath tumors	-2	-0	-0	-2	-0	-2	-NA
Other specified soft tissue sarcomas	20	3	8	9	13	7	1.8
-Pnet/Ewing tumor and Askin tumor of soft tissue	-16	-2	-7	-7	-11	-5	-2.2
-Extrarenal rhabdoid tumor	-1	-1	-0	-0	-0	-1	-NA
-Leiomyosarcomas	-2	-0	-1	-1	-2	-0	-NA
-Synovial sarcomas	-1	-0	-0	-1	-0	-1	-NA
Unspecified soft tissue sarcomas	1	1	0	0	1	0	NA
Germ cell tumors, trophoblastic tumors, and neoplasms of gonads	**16 (2.8)**	**10 (4.8)**	**2 (1.3)**	**4 (2.1)**	**9 (2.8)**	**7 (3)**	**1.2**
Intracranial and intra-spinal germ cell tumors	2	0	0	2	2	0	NA
-Intracranial and intra-spinal germinomas	-1	-1	-0	-1	-1	-0	-NA
-Intracranial and intra-spinal yolk sac tumor	-1	-0	-0	-1	-1	-0	-NA
Malignant extracranial and extra-gonadal germ cell tumors	4	3	0	1	1	3	NA
-Yolk sac tumor of extracranial and extra-gonadal sites	-2	-2	-0	-0	-1	-1	-NA
-Other and unspecified malignant mixed germ cell tumors of extra-cranial and extra-gonadal sites	-2	-1	-0	-1	-0	-2	-NA
Malignant gonadal germ cell tumors	10	7	2	1	6	4	1.5
-Malignant gonadal germinomas	-1	-1	-0	-0	-1	-0	-NA
-Gonadal yolk sac tumor	-7	-4	-2	-1	-5	-2	-NA
-Malignant gonadal tumors of mixed	-2	-2	-0	-0	-0	-2	-NA

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Other malignant epithelial neoplasms and malignant melanomas	**53 (9.5)**	**6 (2.9)**	**15 (9.7)**	**32 (16.6)**	**30 (9.3)**	**23 (9.8)**	**1.3**
Adrenocortical carcinomas	1	1	0	0	0	1	NA
Thyroid carcinomas	4	0	0	4	2	2	NA
Nasopharyngeal carcinomas	14	0	3	11	11	3	NA
Malignant melanomas	1	0	1	0	0	1	NA
Skin carcinomas	23	4	7	12	10	13	0.7
Other and unspecified carcinomas	9	0	4	5	7	2	NA
-Carcinomas of colon and rectum	-2	-0	-0	-2	-2	-0	-NA
-Carcinomas of appendix	-1	-0	-0	-1	-1	-0	-NA
-Carcinomas of thymus	-1	-0	-1	-0	-1	-0	-NA
-Carcinomas of eye	-1	-0	-1	-0	-1	-0	-NA
-Carcinomas of other specified sites	-4	-0	-2	-2	-2	-2	-NA
Other and unspecified malignant neoplasm	**4 (0.7)**	**2 (1)**	**1 (0.6)**	**1 (0.5)**	**4 (1.2)**	**0**	**NA**
Total	**556 (100)**	**209 (37.6)**	**154 (27.7)**	**193 (34.7)**	**322 (57.9)**	**234 (42.1)**	**1.3**

Abbreviations: CNS: Central nervous system; NA: Not applicable; NOS: No other specificity; PNET: Primitive neuro-ectodermal tumor; y: years

When comparing histological categories according to age, the most common types reported in the period of 0-4 years were: neuroblastoma with other peripheral nervous cell tumors (24% of tumors in this age range), lymphomas and reticuloendothelial neoplasms (22%) and renal tumors (14.8%). In 5-9 years period, the most frequent were lymphomas and reticuloendothelial neoplasms (45.5%), CNS and miscellaneous intracranial and intra-spinal neoplasm (13%) and malignant epithelial neoplasms and malignant melanomas (9.7%). In older age group (10-14 years), lymphoma and reticuloendothelial neoplasm (37.9%), malignant bone tumors (20.2%) and malignant epithelial neoplasms (16.6%) were the most frequent.

Comparison of histological type repartition according to gender showed that in boys, lymphomas and reticuloendothelial neoplasms, neuroblastomas and other peripheral nervous cell tumors and soft tissue and other extra-osseous sarcomas were the top three types (37%, 10.9% and 10.9% respectively). In girls, lymphomas and reticuloendothelial neoplasms, neuroblastomas and other peripheral nervous cell tumors and renal tumors were the commonest (29.9%, 13.3% and 11.1% respectively). More details of repartition of each histological type according to age and gender are provided in **Table II.**

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Table II: Comparison of demographic characteristics in the present study with other reported series

	SR M/F	Mean age (range) yrs	Most frequent age group	Total
Peko (congo) [1]	1.3	7.9 (2 months-14 yrs)	5-9 (38%)	65
Effi (Côte D'ivoire) [2]	1.5	7.7 (5 months -14yrs)	5-9 (40.15%)	556
Hesham (Egypt) [11]	1.5	5.6±3.04	<5 years (60.0%)	155
Omotayo (Nigeria) [8]	1.9.1	-	10-15 (40.4%)	324
Sahabi (Nigeria) [12]	1.2 :1	-	-	358
Present series	1.37	7.02 (2 months-14 yrs)	0-4 (37.6%)	556

F: Female; M: Male; SR: sex-ratio; yrs: years

DISCUSSION

Malignant tumors of children are rare. In France, their estimated incidence is 156.6 new cases/1000000 children per year for 2000–2004 [7]. In Morocco, there is no national registry of pediatric malignancies. According to cancer registry of greater Casablanca 2008-2012, frequency of malignant tumors in children under 15 years is 2.2% with an incidence of 10.3 per 100000 [10]. In the region of Fez, there is no data about frequency of these tumors. This study was then carried out and collected a database of pediatric malignant solid tumors from the department of pathology of the university hospital Hassan II where is present the only center of pediatric oncology of the region. It reports, for the first time, data on frequency of different categories of childhood cancer in order to compare them with national and international data.

This study shares the same mean age with other previous studies [1; 2]. Hesham [11], however,

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reported a lower mean age (5.6 years). The most commonly involved age group was 0-4 years (37.6%). This result is in accordance with that reported by other authors like Hesham (Egypt) with a proportion of 60.0% [11]. It is however different from result obtained by Effi (Ivory Coast) that reported a higher frequency in the age group 5-9 years (40,15 %) [2]. This age group was the least common (27.7%) in the present series. In the series by Hesham, children >10 years were the less frequent (12.3%) [11].

Concerning sex, boys were more frequently affected than girls with a ratio of 1.3. This is consistent with sex distribution in other studies that report a male predominance [1; 2; 8; 10-14]

Comparison of demographic characteristics in the present study with other reported series is provided in **Table II**. Lymphomas and reticulo-endothelial neoplasm (35%), neuroblastoma and other peripheral nervous cell tumors, and malignant epithelial neoplasms and malignant melanomas were the most common malignant solid tumors.

Lymphomas and reticuloendothelial neoplasms

Comparison of lymphomas frequency with previous published series showed variable results. In Africa, like in this study, lymphomas are the commonest solid tumors in several countries like Congo (52%) [1], Ivory Coast (49.64%) [2; 15] and Nigeria (55.56%) [8; 16]. An Indian study also reported lymphomas as the most frequent solid tumor [13]. In developed countries like Canada [17], Hungary [14], France [7], Italy [6], Sweden [18] and Switzerland [19], lymphomas are the second solid malignant tumors after central nervous system tumors. Regarding subtype of lymphomas, Hodgkin lymphomas were the most frequent subtype in this survey. The same result was obtained by an Indian [13], a Canadian [17], an American [5] and an Italian [6] studies. In Africa, Burkitt lymphomas is mostly reported as the commonest subtype [2; 8; 12; 15; 16].

Lymphomas and reticuloendothelial neoplasms were more frequent in the age group 10-14 years. The same result was reported by Dalmasso (Italy) [6] and Lacour (France) [7]. Hesham (Egypt) [11] and Omotayo (Nigeria) [8] found a higher proportion of patients of respectively 0-4 years-old and 5-9 years-old.

These tumors were more frequent in boys, result that is consistent with a number of other studies [6-8; 11; 19].

Neuroblastomas and other peripheral nervous cell tumors

Concerning neuroblastomas and other peripheral nervous cell tumors, they were the second most frequent tumors in the current survey (11.8%) after lymphomas and reticuloendothelial neoplasms. This is consistent with the finding of an Egyptian study [11]. It is however different from results of most studies that reported this type as the third most frequent solid malignancy after CNS tumors and lymphomas [6; 7; 14; 17; 19] or after lymphomas and renal tumors [13]. Neuroblastomas were less common in other studies like the study by Omotayo (Nigeria) [8] that found a frequency of 1.85%.

Analysis according to age revealed, in the current survey, a highest frequency of these tumors in the age group 0-4 years. The same result was found by most studies [2; 5-7; 11; 19]. Omotayo (Nigeria) [8], however, found an equal repartition in the three groups.

This study shared the equal distribution between boys and girls with other studies [11; 19]. Others, however, showed a male preponderance [6; 8].

Malignant epithelial neoplasms and malignant melanomas

Malignant epithelial neoplasms and malignant melanomas represented in the current study 9.5% of solid malignant tumors and were the third most common tumors. This frequency is higher in comparison with the frequency reported by Peko (Congo) (5%) [1] and Effi (Ivory Coast) (7.91%) [2]. In developed countries, carcinomas were very rare in comparison with other tumors [6; 14; 17-19]. Among carcinomas, skin carcinomas were the commonest in this study.

This group of tumors was more frequent in the age group 10-14 years. The same result was reported by Omotayo (Nigeria) [8], Dalmasso (Italy) [6] and Lacour (France) [7]. Patients were mainly male, like in the study by Omotayo (Nigeria) [8]. Other studies reported a female predominance [7; 19] or an equal sex distribution [6].

CNS and miscellaneous intracranial and intra-spinal neoplasm

In Europe [6; 7; 14; 18; 19] and Canada [17], central nervous system tumors are the second most frequent malignancy after leukemia, and the most frequent solid tumors. In India [13], they were classified as the third solid malignancy after lymphomas and renal tumors. In an Egyptian study, they were less frequent (1.9% of solid tumors) [11].

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The results presented in the current study revealed that these tumors were the fourth solid malignancies and were, as reported by Dalmasso (Italy) [6], more frequent in the group 5-9 years. Other authors, however, observed a higher frequency in the group 0-4 years [5; 7; 11]. Analysis of sex distribution revealed a male predominance like in other series [6; 19].

Soft tissue and other extra-osseous sarcomas

Soft tissue and other extraosseous sarcomas were the fifth most frequent tumors (9%) in this survey. Effi (Ivory Coast) reported a frequency of 9.17% [2] and Peko (Congo) a frequency of 6% [1]. These tumors were frequently classified as the fourth [1; 6; 7; 11; 17; 19] or the fifth [13; 14] most frequent solid malignancies.
In contrast to the result published by some authors [6; 7; 11] that report a higher frequency of these tumors in the group 0-4 years, these tumors were mainly diagnosed in the age group 10-14 years in this survey. Sex analysis found, as reported by most series [6; 7; 11; 19], a higher proportion of boys.

Malignant bone tumors

The malignant bone tumors constituted 5% of tumors in this survey and in the survey by Peko (Congo) [1], 4.5% in the study of Hesham (Egypt) [11], 4.14 % in the study by Effi (Ivory Coast) [2] and 3.09% in the survey by Omotayo (Nigeria) [8]. Their frequency was higher in the report by Dalmasso (Italy) [6] or by Michel (Switzerland) [19] (respectively 8.3% and 5.3% of all malignanties including leukemia).
This group was mostly observed in an older age (10-14 years). This is consistent with findings of other studies [6-8; 11; 19]. Girls were more frequently affected than boys, in contrast to the finding by Omotayo (Nigeria) [8] (male predominance), or by Dalmasso (Italy) [6] and Michel (Switzerland) [19] that found nearly the same repartition in the two sexes.

Renal tumors

Renal tumors frequency was variable. In some studies, they were relatively frequent and represented the second [13; 20] or the third [1; 2; 11; 16; 18] solid malignant tumor. They accounted for 9% of solid malignancies in the survey by Peko (Congo) [1], 5.71 % in the study by Effi (Ivory Coast) [2], 9.7% in the study of Hesham (Egypt) [11], 8.33% in the survey by Omotayo (Nigeria) [8], 13.2% in the study by Memon [20] and 7.9% in this study. In other studies, they were classified among the less common tumors [6; 7; 17; 19].
The highest frequency was identified in the age group 0-4 years. The same result was found by most studies [1; 2; 5-8; 11]. These tumors occurred frequently in girls like in some studies [1; 6]. In others, there was a male preponderance [8] or nearly an equal repartition in boys and girls [11; 19].

Retinoblastoma

Retinoblastoma was rare in the present survey and accounted for 4.8% of all tumors. This is discordant with the result found by a Pakistani [20] study that reported retinoblastoma as the most common solid malignancy (38.9%). Other studies found that this tumor was the second commonest solid malignancy like an Ivoirian [2] and a Congolese [1] studies that reported a proportion of respectively 10.54 % and 20%. In another Nigerian survey [8], its proportion was 7.72% and was the third commonest solid malignant neoplasm. In developed countries, retinoblastoma was one of the less frequent malignancies [6; 14; 17-19].
Its highest frequency was identified in the age group 0-4 years in this survey. The same result was found by most studies [2; 5-8]. There was a male preponderance like in some series [6; 8].

Germ cell tumors, trophoblastic tumors, and neoplasms of gonads

These tumors were rare and accounted for 2.8% of all tumors in this survey. This result is close to the results reported by some studies [1; 2]. They were, like mostly reported in the literature [5-7], more frequent in the age group 0-4 years. Omotayo (Nigeria) [8], however, found a peak in the group 10-14 years. The current study revealed, like the study by Omotayo (Nigeria) [8], and unlike the study by Dalmasso (Italy) [6], a male predominance.

Hepatic tumors

Hepatic tumors were extremely rare and represented only 1.8% of tumors. This result is consistent with results published by other authors [6; 11; 14; 17-19]. They were nearly exclusively seen in the age group 0-4 years like in previous series [5-7] and were seen frequently in females, in contrast to other series [7; 19].
Comparison of histological repartition in each age range showed that neuroblastomas and other peripheral nervous cell tumors, lymphomas and

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reticuloendothelial neoplasms and renal tumors were the commonest types in the age range 0-4 years (24%, 22% and 14.8% respectively). CNS tumors were less frequent, in contrast to European [6; 7] and American [5] studies that reported these tumors as the most frequent solid malignancy in this age group, followed by neuroblastomas [5-7] and renal tumors [6; 7]. An Egyptian study [11], however shares the same histological repartition. In a Nigerian survey [8], retinoblastoma was the most frequent, followed by lymphomas and renal tumors.
In age range 5-9 years, it was observed, in the current study, an increase in the frequency of lymphomas and reticuloendothelial neoplasms, CNS and miscellaneous intracranial and intraspinal neoplasms and malignant epithelial neoplasms and malignant melanomas (45.5%, 13% and 9.7% respectively) and a decrease of sympathic nervous system and renal tumors proportion. In developed countries [5-7], CNS tumors remain the most frequent solid tumor in this group, followed by lymphomas. In Egypt [11] and Nigeria [8], lymphomas were the most frequent. Malignant epithelial neoplasms and melanomas were rare in this group, in contrast to this series.
In older age (10-14 years), lymphomas and reticuloendothelial neoplasms remained the most frequent (37.9%). It was noted an increase of bone tumors frequency (20.2%) that were the second most frequent tumors, followed by epithelial neoplasms (16.6%). In previous published series, lymphomas and bone tumors were classified among the top three solid malignancies [6; 7; 8; 11]. CNS tumors remained the commonest solid tumors [5-7] and epithelial tumors were less frequent in comparison with other types [5-8; 11], in contrast to this survey where frequency of the former decreased and frequency of the latter increased.

CONCLUSION

Pediatric malignant tumors are rare and heterogeneous tumors. In the current study, they shared some characteristics with African, European and American series such as a male predominance and a high frequency of lymphomas. Some differences were however found especially a lower frequency of central nervous system tumors, the most frequent solid malignancy in developed countries and a higher frequency of epithelial tumors. Other larger studies are necessary to establish a regional and even a national register of pediatric cancer.

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