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Pediatric Brain Tumor

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Abstract: Tumors of the Central Nervous System (CNS), occur relatively frequently during the early years of life. They are the most common solid tumors of childhood and are second only to leukemia in overall cancer incidence and account for a high proportion of deaths. In different studied, performed in several countries, astrocytomas and other gliomas (combined) accounted for half of the CNS malignancies, followed by PNET/MB and ependymomas and then craniopharyngioma. We have undertaken a perspective study with 349 brain tumor patients, ranging from 0-14 years of age, throughout a 5 years period (1998-2003). Who were admitted in Tabriz Koodakan Hospital or were diagnosed in Tabriz Hafez CT scan center, during radiological evolutions by CT. Craniopharyngioma was the most common type of tumors among patients studied in the series and astriocytomas was second and medulloblastoma was third common type. The male/female proportion of patients in total brain tumors according to the results is 1.56 and it is similar to earlier studies. About medulloblastoma and ependymomas, male/female proportion of patients in study is <1 (0.88, 0.7), but in earlier series it seems to be >1 (about 1.4). Age-related distribution of brain tumors in children under the age 14 was similar to that of other series to some extent. Also, since the causes and risk factors of CNS cancers remain largely undetermined, we could not reach a significant relationship between the tumors and location of life of patients. Hope that the results make a useful for the future studies in this field and differences obtained in this study with results of other series can help us more and more in management and treatment strategies if brain tumors in children of the population.

Key words: Brain tumor, childhood, prevalence, central nervous system, patient, Iran

INTRODUCTION

Tumors of the Central Nervous System (CNS) occur relatively frequently during the early years of life. They are the most common solid tumors of childhood and afflict approximately, 1,500 patients every year in the United States. Reported incidence rates have varied from 2-5/100,000 children. Representing 20% of all malignancies, they are second only to leukemia in overall cancer incidence and account for a high proportion of deaths (Sala *et al*., 1999; Miltenburg *et al*., 1996; Pollack, 1994).

Although, the incidence of leukemia has remained relatively stable, the incidence of brain tumors has increased approximately, 2% per year in the past 20 years. A review of earlier studies on the incidence of intracranial space-occupying lesions indicates that the relative frequencies of pathologic varieties have changed critchley; writing in 1925, found tuberculoma to be the most common intracranial tumor of childhood. Subsequent surveys by Cuneo and Rand stressed the preponderance of gliomas. Meningiomas and neurinomas were virtually absent, except in association with neurofibromatosis. Tuberculomas are now rare in the developed countries. From 1981 through 1993, the incidence of Primitivneuroectodermaltumor/Medullo-blastoma (PNET/MB), the most common malignant posterior fossa tumor has risen >4% per year (Roush *et al*., 1992, 1993; Cohen *et al*., 1986; Crouse and Berg, 1972; Dastur and Desai, 1965).

Pediatric brain tumors include a spectrum of both glial and nonglial tumors that differ significantly in location and biologic behavior from that of adults (Table 1) (Tobias and Hayward, 1990). Subtentorial tumors constitute >50% of all intracranial space-occupying lesions in children in adults, only 25-30% of tumors originate below the tentorium. In children younger then age 1 year, as in adults, supratentorial tumors are most frequent in infancy these often arise from hamartomas or other congenital malformations (Tobias and Hayward, 1990).

Neurological symptoms produced by brain tumors are general or local. General symptoms result from increased intracranial pressure, which results directly from progressive enlargement of the tumor within the limited volume of the cranial vault; local symptoms are due to the

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Table 1: Incidence of brain tumors in the pediatric population younger than 15 years of age verus all ages (%)

Tumors	Children (%)	All ages (%)
Gliomas	70	45
Astrocytoma	30	15
Glioblastoma	5	15
Oligodendroglioma	1	8
Medulloblastoma	20	4
Ependymoma	10	4
Meningiomas	1	15
Neurinomas	<0.5	6
Pituitary adenoma	1	6
Metastases	<0.5	5-20
Craniopharyngioma	10	3

effects of the tumor on contiguous areas of the brain (Sala *et al*., 1999). Increased intracranial pressure produces headaches, vomiting, impaired vision and changes in consciousness and when sutures have not fused, an enlarging head (Miltenburg *et al*., 1996). Advances in computer technology have helped establish more effective methods of identifying and characterizing pediatric brain tumors (Dastur and Desai, 1965; Kuttesch, 1997). The primary objective for any diagnostic MRI or Computed Tomography (CT) study is to distinguish between normality and abnormality and to determine the relevance of the findings on neuroimaging to the clinical situation. In the initial, evaluation of child with brain tumor, careful staging is particularly essential to appropriate treatment decisions. This process is critical, as the initial surgical resection may be the only time some tumors can be cured. Several factors contribute to assisting the radiologist with the differential diagnosis of a particular tumor the age of the patient, the location of the tumor and the inherent imaging features.

In the experience of Sartor *et al*. (1987), who compares the accuracy of CT scanning and MRI in delineating mass lesions in sellar region, MRI in delineating to CT scanning in 54% of cases, superior in 41% inferior in only 5% (Rorke, 1996; Tovi *et al*., 1990; Sartor *et al*., 1987).

The aim of this study was to determine frequency of different type of pediatric brain tumors and sex-age related distribution of each tumors.

MATERIALS AND METHODS

This study was performed on 349 subjects (213 males and 136 females) with age ranging from 1-14 years. The cases were selected from patients admitted in Tabriz Koodakan Hospital from 1998-2003 with the diagnosis of brain tumor. Of 5 years (1998-2005) collection of cases with this diagnosis, which were evaluated with CT scanning in Tabriz Hafez CT scan center.

It should be also noted that the data reported here are comprised of CNS tumors, which four of them are metastatic and others are primary brain tumors. The goal was the study of incidence of brain tumors in East Azerbaijan and epidemiologic deference's of these tumors with statistics and numeric of other parts of the world.

We studied incidence of pediatric brain tumors and assessed correlation between these tumors and patient's age, sex and residencies, for further information.

For that we studied patient's past medical history that was registered in their documents in hospital. The kinds of pediatric brain tumors that was determined from patient's hospitally documents was classified in 9 groups. These groups are: *Astriocytomas*, *Oligodendroglioma*, *Medulloblastoma*, *Lymphoma*, *Craniopharyngioma*, *Dermoid teratoma*, *Choroids plexus* papilloma and *Ependymomas*.

Parameters studied: Parameters studied were the kinds of tumors, age and sex related distribution of each tumor and patient's residency for each of them.

RESULTS AND DISCUSSION

From 349 patients with brain tumor, 61% of them were male and 39% were female. From these patients 2 were under the age 1, 9 were 1-3 years old, 93 were between 4-7 years old and 245 were between 7-14 years old. The count and percentage of total for each tumor in each sex are shown in Table 2.

The count of age related distributions of each tumor are shown in Table 3. Tumors of CNS afflict approximately, 1,500 patients every in the USA. Representing 20% of all malignancies and are second only to leukemia in overall cancer incidence (Sala *et al*., 1999; Miltenburg *et al*., 1996; Pollack, 1994).

Diffuse intrinsic brainstem gliomas constitute 15-20% of all CNS tumors in children and are the main cause of death in children with brain tumors (Hargrave *et al*., 2006). Kadri *et al*. (2005) found that 47% of brain tumors were located in the supratentorial and 53% in the infratentorial region. The most common tumor found in the childhood population was medulloblastoma (27.5%), followed by astriocytomas (25.8%), then craniopharyngioma (14.1%) (Kadri *et al*., 2005).

According to the earlier studies gliomas, *Astriocytomas*, *Oligodendroglioma*, *Meduloblastoma*, *Ependymomas* and *Craniopharyngioma* account for 70, 1, 20, 10 and 10 present of CNS tumors of childhood, respectively (Tobias and Hayward, 1990).

Histopathological diagnoses were as follows: *Pilocytic astriocytomas* (48.2%); *Medulloblastoma* (22.2%); *Ependymomas* (18.5%); *Fibrillary astriocytomas* grade 3 (3.7%); *Cystic oligodendroglioma* (3.7%) and *Hemangioblastoma* (3.7%) (Akay *et al*., 2004).

Table 2: Sex Related distribution of tumors

	Gender (%)		
Tumors type	Male	Female	Total (%)
Astrocytoma	64 (18.3)	32 (9.2)	96 (27.5)
Oligodendroglioma	1 (0.3)	0 (0.0)	1 (0.3)
Medulloblastoma	31 (8.9)	35 (10.0)	66 (18.9)
Lymphoma	2 (0.6)	1 (0.3)	3 (0.0)
Craniopharyngioma	68 (19.5)	44 (12.6)	112 (32.1)
Dermoid	1 (0.3)	0 (0.0)	1 (0.3)
Tratoma	7 (2.0)	2 (0.6)	9 (2.6)
Chroid plexus papilloma	2 (0.6)	4 (1.1)	6 (1.7)
Ependymoma	36 (10.3)	51 (14.6)	87 (24.9)

Table 3: Age related distribution of tumors

	Age			
Tumors type	0-7	3-7	7-12	12-18
Astrocytoma	0	6	49	41
Oligodendroglioma	0	1	0	0
Medulloblastoma	0	38	20	8
Lymphoma	1	0	2	0
Craniopharyngioma	0	4	71	37
Dermoid	0	0	1	0
Tratoma	6	3	0	0
Chroid plexus papilloma	0	4	2	0
Ependymoma	2	37	12	0
Total + metastasis	11	93	158	87

Varan *et al.* (2006) had 32 (37.2%) patients with embryonic tumors (21 medulloblastoma, 4 ependymoblastoma, 5 with atypical teratoid rhabdoid and 2 with supratentorial primitive neuroectodermal tumors), 21 (24.4%) with ependymomas, 14 (16.3%) with optic glioma, 10 (11.6%) with astriocytomas, 3 (3.5%) with pons glioma and 6 (7.0%) with others Varan *et al.* (2006).

About midline tumors, craniopharyngioma accounts 55% of lesions and is most common of these tumors (Sala *et al*., 1999). According to study, craniopharyngioma is the most common type of brain tumors (32.1%) and pilocytic astriocytomas is second tumor (27.5%).

According to the study of childhood cancer incidence in north America (1988-1992) in which, the data analyzed for it consist of cancers diagnosed among children under the age of 15 years and included in the North American Association of Central Cancer Registries (NASCCR), male/female ratio of pediatric brain cancers in total is about 1.12 and for astriocytomas the ratio is 1.07 and for medulloblastoma it is about 1.38.

The ratio of male to female occurrence was 1:1.2 (52% males, 48% females) (Kadri *et al*., 2005). The appearance of data show that in the study, male/female proportion of patients with brain tumor diagnosis is about 1.56.

For astriocytomas this proportion is about 2 and about mesulloblastona is 0.88. As seen above, the incidence of brain tumors in total is higher in males than females and it is not in contrast with earlier research. But the male/female proportion suffer form medulloblastoma in the study is in contrast with earlier results. Such a difference is seen about ependymomas in which the male/female proportion of patients in this study was 0.7, but in previous trials, result is 1.4. Craniopharyngioma has a small sex related distribution differences in this study compare with other series (m/f ratio is about 1.50).

About 55.5% of patients with Teratoma diagnosis were under the age of 3 and others were at the 3-7 years. According to other series (Table 1-2), Teratoma is a tumor with the age at proportion of 0-3 years (Tobias and Hayward, 1990) and this is equal with these results.

About medulloblastoma no certain distribution pattern of age-related patients was found in earlier series (Tobias and Hayward, 1990) and in this study, from 66 patients with this diagnosis, no patient has found under the age of 3 and 8 patients (12.2%) were elder than 13, but 58 patients (87.8 of medulloblastomas) were at the age between 3-13 and of them, 34 patients (51.5%) were at the range of 7-10 years old.

CONCLUSION AND RECOMMENDATION

As regard the results of this study, determines for us that the epidemiology of brain tumors in children of the population is different form other countries in some aspects, such as common tumor types, we should adjustment the healthy programs according to the statistics.

It should be mentioned that the brain tumor treatment in itself (including surgeries, radiotherapy, chemotherapy) is harmful to the brain tissue, thus, increasing the risk of sequels and because of the neurological disorders in surviving patients are related to the type of tumor and side effects on impaired structures, therapeutic methods applied and patients age, we should pay more attention to patients with brain cancer in early diagnose of their illness and screening programs for their probable disease.

Now, we know that craniopharyngioma is the most common tumor type among the children under the age of 18 in the population. We hope that this and other such differences obtained among the results and other series can help us more and more in management and treatment strategies of brain tumors in children and make a useful data for the future studies in this field.

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