Research Article

Epidemiological Survey of Central Nervous System Tumors Admitted in a Reference Hospital in the North Fluminense Region in Brazil

Danielli Aparecida de Souza Silva[1], Bruna Arêas Ribeiro[1], Rayane Figueiredo Silva Moreira Carvalho[1], Júlia Moraes Ferreira[1], Marina Siqueira Teixeira[1], Alessandra Oliveira Ferrari Gomes[2], Frederico Paes Barbosa[1,3] and Luisa Aguirre Buexm[1,4]*

[1]*Medicine School, Faculdade de Medicina de Campos, Campos dos Goytacazes, Brazil*
[2]*Dental Service, Prefeitura da Cidade do Rio de Janeiro, Rio de Janeiro, Brazil*
[3]*Álvaro Alvim School Hospital, Fundação Bendito Pereira Nunes, Campos dos Goytacazes, Brazil*
[4]*Dental School, Universidade Federal Fluminense, Niterói, Brazil*

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ABSTRACT

Cancer is a major worldwide health problem, being an important cause of morbidity and mortality to population. In global scale, nervous system cancers represent around 1.8% of all malignant tumors in the planet. From 2020 to 2022, it's estimated around 11.090 new cases of this type of cancer in Brazil. This study aims to raise epidemiological data on central nervous system tumors admitted to the oncology department of a reference hospital in the North Fluminense region in Brazil. Forty-four patients were included in this study, who were predominant males (56.8%), aged between 41 to 60 years old (47.7%), with tumors located primarily in the brain (65.9%) and histopathologically classified as glioblastomas (38.6%). Patients had no family history of cancer (64.3%), were non-smokers (68.2%), non-alcoholics (70%), undergoing primary surgical treatment (34.1%), who did not undergo adjuvant treatment (84.1%) and who died from the disease (66.7%). Glioblastoma was the most incident malignant neoplasm, followed by astrocytoma for both sexes, corroborating with literature data. In summary, this work contributes to a better understanding of these tumors, focusing on their prevention, early diagnosis and treatment.

Introduction

Cancer is a major worldwide health problem, being a relevant cause of morbidity and mortality in human population. In 2020, the International Agency for Research in Cancer (IARC) registered 19,292,789 new cases of cancer in the world, being brain and central nervous system tumors the nineteenth most incident (excepting non-melanoma skin neoplasms), with 308,102 new cases [1]. In Brazil, the National Cancer Institute (INCA) registered 626,030 new cases of cancer in 2020. Central nervous system tumors occupied the tenth position among the most incident neoplasms (excepting non-melanoma skin neoplasms) in both sexes, with 11,100 new cases. In 2019, this kind of tumor corresponded 4,1% and 4,2% of the deaths by cancer in men and women, respectively [2].

Among central nervous system (CNS) tumors, primary ones are more common than metastases, corresponding to 50% to 75% of the total [3].

Primary CNS neoplasms can be classified as gliomas, which the most frequent are astrocytomas, oligodendrogliomas and ependymomas, or as nongliomas. In the second group, neuronal and glioneuronal tumors are included, such as gangliogliomas and dysembryoplastic neuroepithelial tumor, choroid plexus tumors, embryonal neoplasms, including medulloblastoma, primary CNS lymphoma and meningiomas [3, 4]. Unlike other tumors, these are not staged, but instead, graded from I to IV depending on the neoplasm biological behaviour, according to World Health Organization (WHO) classification [5].

The symptoms of CNS neoplasms are influenced by the mass effect, parenchymal infiltration, and tissue destruction. The prognosis can vary according to these parameters, in addition to the neoplasm types and growth rates [3, 4]. In order to minimize the tumor impact, it's essential to observe symptoms such as headache, convulsions, loss of neurological functions, imbalance, behaviour changes, blurred vision, drowsiness and

*Correspondence to: Luisa Aguirre Buexm, Department of General Pathology and Pathological Anatomy, Medicine School, Faculdade de Medicina de Campos, Campos dos Goytacazes, Brazil; E-mail: labuexm@hotmail.com

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coma. On the other hand, the presence of neurological symptoms may be related to a poor prognosis, including other factors, such as: tumor size larger than 5 cm, patient age over 40, progressive disease, tumor crossing midline, performance status ≥1 and partial tumor removal [6]. In summary, early diagnosis and curative treatment can be a challenge. Given the mortality rates and difficulties in diagnosis and treatment, it's necessary to study more and understand CNS tumors in order to better conduct future cases. Thus, this study aims to raise epidemiological data on CNS tumors admitted to the oncology department of a reference hospital in the North Fluminense region in Brazil.

Methods

It is an observational, retrospective and descriptive study, carried out in the oncology hospital department, with secondary and anonymous analysis of medical records of patients with nervous system tumors from 2010 to 2017. Those over 18 years old with CNS tumors were included in the study, while those under 18 with a negative test for these neoplasms were excluded. All information collected was gathered in a spreadsheet prepared using Excel software (Microsoft Office). The sociodemographic and clinicopathological variables were presented as proportions and means, using graphs and tables.

Results

The study included 44 patients who were predominant men (56.8%), aged between 41-60 years old (47.7%), with tumors located primarily in the brain (65.9%) and histopathologically classified as glioblastomas (38.6%). Patients had no family history of cancer (64.3%), were non-smokers (68.2%), non-drinkers (70%), undergoing primary surgical treatment (34.1%), did not undergo adjuvant treatment (84.1%), and died from the disease (66.7%) (Figure 1 and Table 1). The percentage of patients who presented unspecified malignant neoplasms in the brain was 63.63%, 11.36% of the neoplasms were in the meninges, 4.54% in the cerebellum, 4.54% in the brainstem, except lobes and ventricles, 4.54% in the spinal cord, 2.27% in the pituitary gland, 2.27% were unspecified CNS, 2.27% in the frontal lobe, and 2.27% in the cerebral ventricle (Figure 1).
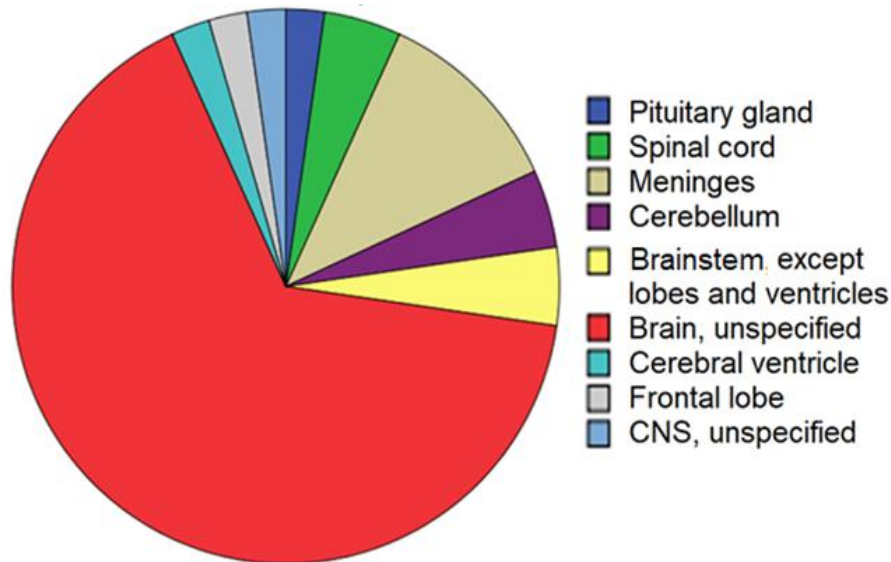
Figure 1: Primary anatomical location of central nervous system malignant neoplasms in patients.

Table 1: Sociodemographic and clinicopathological characteristics of patients (No. = 44).

Variable	Category	No. Of cases	% of cases
Gender	Male	25	56.8
	Female	19	43.2
Age	≤40 years	9	20.5
	41-60 years	21	47.7
	>60 years	14	31.8
Family History	Yes	5	35.7
Of Cancer	No	9	64.3
Tobacco	Yes and ex	7	31.8
	No	15	68.2
Alcohol	Yes, social and ex	722	15.7
	No	1478	32.1
	Astrocytoma	6	13.6
	Ependymoma	3	6.8
Histopathological	Glioblastoma	17	38.6

Classification	Meningioma	4	9.1
	Oligodendroglioma	3	6.8
	Others	11	25.1
Primary Treatment	Surgery	15	34.1
	Chemotherapy	4	9.1
	Radiotherapy	8	18.2
	Paliative and others	17	38.6
Adjuvant Treatment	Yes	7	15.9
	No	37	84.1
Death	Yes	12	66.7
	No	6	33.3

Discussion

In 2020, according to IARC, CNS tumors were slightly more incident in men than in women (approximately 1.2:1), information which was also present in this study, where there was a proportion of 1.32:1 cases [7]. In both sexes, glioblastoma was the most incident malignant neoplasm (38.6%), followed by astrocytoma (13.6%). CBTRUS Statistical Report also presented glioblastoma as the most common primary malignant brain tumor (48.3%), being more common in older adults and 1.58 times more frequent in males compared to females. In the same study, astrocytoma (19.1%) was the second most frequent histopathological diagnosis among gliomas [5].

Considering confirmed risk factors for CNS tumors, radiation exposure and hereditary genetic predisposition can be included, as in neurofibromatosis types 1 and 2, tuberous sclerosis, retinoblastoma and in Li-Fraumeni, Von-Hippel Lindau, Turcot and Gorlin syndromes [8]. Meanwhile, a recent cohort study revealed that cigarette smoking may be significantly associated with an increased risk of developing a malignant glioma, being this association stronger for those who smoked ≥ 20 cigarettes per day [9]. It remains uncertain if there is a relation between alcoholism and the development of CNS tumors [10]. However, considering the previously mentioned risk factors, this study found that the majority of the patients had no family history of cancer (64.3%), were non-smokers (68.2%) and non-drinkers (70%).

In both sexes, glioblastoma (38.6%) was the most incident malignant neoplasm. The glioblastoma corresponds to a WHO grade IV astrocytoma, usually found in cerebral hemispheres, but it can also occur in the cerebellum, brainstem or spinal cord. It's more common in older patients, as a primary glioblastoma, and less frequently it occurs in younger individuals, due to progression of a lower-grade astrocytoma [3]. Other kinds of astrocytoma were the second most incident CNS tumor (13.6%) in both sexes. The other major astrocytomas are the ones corresponding to WHO grades II and III, respectively diffuse astrocytoma and anaplasic astrocytoma [3].

According to IARC, in 2020, there were 251,329 deaths in both sexes, being 138,277 in males and 113,052 in females [7]. Considering the high mortality involving CNS tumors, it's essential to guarantee an early diagnosis and to better understand the variables influencing their emergence and prognosis. The development of studies with this purpose must be encouraged, and this study aims to contribute to the database.

Conclusion

Glioblastoma was the malignant neoplasm with the highest incidence, followed by astrocytoma for both sexes. CNS tumors were predominant in men, corroborating the literature data. Most patients were non-smokers and non-drinkers and did not have family history of cancer. Therefore, the majority of patients did not present the studied risk factors. Besides, the high mortality rate among these patients reinforce the importance of this theme. In this sense, the study contributes to a better understanding of the pathology and encourages its prevention, early diagnosis and treatment strategies.

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