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An Audit of Histopathological Cases of Spinal Cord Tumor in Single Tertiary Care Hospital

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ABSTRACT

OBJECTIVE: To determine the frequency of different spinal cord tumor subtypes across age and gender groups.

METHODOLOGY: A retrospective cross-sectional study was conducted at the Basic Medical Sciences Institute of JPMC Karachi, Pathology Department between October 2019 and September 2022. All spinal cord tumor specimens submitted for histological assessment were included in the research. The age, gender, and histological results of the samples were considered while reviewing them in detail.

RESULTS: A total of 25 cases of spinal cord tumors were examined, according to this study. The most common histopathological spinal cord tumors are Meningioma, followed by Astrocytoma. Patients with spinal cord tumors ranged in age from 7 to 65 years old, with a mean age of 37. The findings of this study show that with a male-to-female ratio of 0.4:1, spinal cord tumors are more common in females than in males.

CONCLUSION: Meningioma 13 (7.2%) and astrocytoma 3 (1.7%) were the most common types of spinal tumors observed. Patients with spinal tumors are more likely to be in their 30s, and they also tend to be more prevalent in women.

KEYWORDS: spinal cord, tumor, Astrocytoma, Meningioma, histopathology, CNS.

INTRODUCTION

The most prevalent kind of CNS malignancy is brain tumors. Meninges, spinal cord, and cranial nerves house most remaining malignancies[1]. There are two main categories of spinal cancers: primary tumors, which come from bone, meningeal, or spinal cord cells. The second category consists of metastatic lesions, which start in other cells and spread to the spinal cord and surrounding tissues[2]. Metastatic spine cancers travel through the hematogenous pathway to invade the vertebral column (e.g., via the Batson plexus)[3].

Compared to adults, juvenile patients are more likely to have spinal cord tumors[4]. (Ostrom et al., 2021) Found that high doses of ionizing radiation are linked to malignancies of the brain and other parts of the central nervous system. Numerous cancer syndromes, including tuberous sclerosis, Li Fraumeni syndrome, and neurofibromatosis types I as well as II, influence the risk of brain and other CNS malignancies[5].

For patients and medical personnel, spinal cord injury from the tumors of the spinal cord poses special challenges because of decreased life expectancy, higher cancer-related comorbidities, and neurological and functional impairments[6].

PURPOSE OF THE STUDY

Study data was collected from the Pathology Department, B.M.S.I, JPMC Karachi. The study aimed to determine the frequency of different types of spinal cord tumors in a single tertiary care hospital.

METHODOLOGY

A retrospective research was conducted at JPMC Karachi's Pathology Department, Basic Medical Sciences Institute, between October 2019 and September 2022. Out of the 180 CNS tumors received, 25(13.9%) spinal cord tumor specimens submitted for histological evaluation during the study period were analyzed. Before the study was conducted, the Ethics Committee gave its approval.

Spinal cord tumor specimens were kept in a 10% formalin solution in compliance with recognized standards, and the biopsy sample was processed and paraffin-embedded. Histopathological sections 3–4 µm thick were obtained, and hematoxylin and eosin staining were used to visualize the cells. Two pathologists used a light microscope to examine the sections and diagnose the pathology. The age and gender of the patients were disclosed in the early surgical biopsy reports. The research's conclusions of spinal cord tumors were statistically examined and given in percentages out of all 180 CNS tumors.

RESULTS

Table I: The frequency of each spinal cord tumour morphological form is displayed. Meningioma 13 (52%) was the most prevalent tumor in the entire spinal cord, followed by Astrocytoma and Ependymoma 3 (12%). A P-value of less than 0.0001 was deemed statistically significant using the Chi-Square test.

Table I: All Morphological Types of Spinal Cord Tumors

Diagnosis	Number of spinal cord tumors (%)
Meningioma	13(52)
Astrocytoma	3(12)
Ependymoma	3(12)
Schwannoma	2(8)
Chondrosarcoma	1(4)
Ganglioglioma	1(4)
Metastatic neoplasm	1(4)
Neurofibroma	1(4)
Total	25(100)

Table II: Spinal cord tumors distribution by gender. Meningioma, Astrocytoma, Schwannoma, Chondrosarcoma, Metaplastic neoplasm and Neurofibroma are more common in females, while Ependymoma and Ganglioglioma are more frequent in males. The Chi-Square test showed a P-value of 0.43, which was statistically non-significant; spinal tumors were also commonly found in females, with a male-to-female ratio of 0.4:1.

Table II: Types of Spinal Cord Tumor By Gender

Diagnosis	Gender				M: F
	Male		Female		
	N	%	N	%	
Meningioma	3	1.7	10	5.6	1:0.2
Astrocytoma	1	0.6	2	1.1	0.5:1
Schwannoma	0	0.0	2	1.1	0:1
Chondrosarcoma	0	0.0	1	0.6	0:1
Ependymoma	2	1.1	1	0.6	1:0.5
Ganglioglioma	1	0.6	0	0	1:0
Metastatic neoplasm	0	0.0	1	0.6	0:1
Neurofibroma	0	0.0	1	0.6	0:1
Total	7	4	18	10.2	0.4:1

Table III: Age-specific spinal cord cancer distribution. Ependymoma was 18(SD=±6) years old, Schwannoma was 26(SD=±6) years old, Astrocytoma was 30(SD=±14) years old, and Meningioma was 46(SD=±12) years old. Chondrosarcoma was diagnosed at age 30, Ganglioglioma at age 7, Metastatic Neoplasia at age 62, and Neurofibroma at age 45. The age

range of the 25 spinal cord tumors was 7–65 years old, with a mean age of 37(SD=±16) years. Using a one-way ANOVA, the P-value of 0.005 was statistically significant.

Table III: Types of Spinal Cord Tumors By Age

Diagnosis	N	%	Age in years			
			Mean	SD*	Min.	Max.
Meningioma	13	52	46	12	30	65
Astrocytoma	3	12	30	14	14	38
Ependymoma	3	12	18	6	11	23
Schwannoma	2	8.0	26	6	21	30
Chondrosarcoma	1	4.0	30		30	30
Ganglioglioma	1	4.0	7	--	7	7
Metastatic neoplasia	1	4.0	62	--	62	62
Neurofibroma	1	4.0	45	--	45	45
Total	**25**	**100**	**37**	**16**	**7**	**65**

*Note: SD cannot be calculated in the case of (n=1). The standard deviation is substantial because of the large range of minimum and maximum age differences.

DISCUSSION

Of the 180 CNS malignancies in our investigation, 25 involved the spinal cord. Consistent with the present investigation, cross-sectional retrospective research conducted in Nepal over 4 years documented 138 cases, of which 25 were spinal tumors[7]. **Shrestha et al. 2020** research states that within 8 years, 12% of cancers grow in the spinal cord; this number is closer than our study[8]. Our research indicates that Meningioma 13(52%) was the most prevalent tumor in the spinal cord, Astrocytoma 3(12%) and Ependymoma 3(12%) came next. Meningioma was the most pervasive spinal cord tumor, according to the Indian study, which is consistent with our findings[9]. Conversely, another study discovered that the most prevalent spinal tumors were Schwannomas[8].

In both studies, the percentages of tumors in the spinal cord were not stated. Additionally, a recent study shows that women who have a ratio of men to women of 0.4:1 are at a higher risk of developing spinal cord malignancies. With a ratio of men to women of 0.6:1, spinal cord tumors are more common in women, per a related previous study conducted at B.M.S.I, JPMC Karachi[10]. Contrary to our findings, the male-to-female ratio of 2.1:1 indicated that spinal cord tumors were more common in males[11].

According to present research, the average age of patients with tumors of the spinal cord is 37. The mean age of the research was not specified, but a prior study from the same institute indicates that individuals between the ages of 31 and 40 are more likely to have spinal cord tumors[10].

In the current study, 13 (52%) Meningioma was discovered in spinal cord tumors, with 3(1.7%) male and 10(5.6%) female. The age range is thirty to sixty-five years old. Similarly, an Indian study reveals that Meningioma was the most prevalent kind of spinal cord tumor[9].

In the present research, there were 3 cases of Astrocytoma (12%), including 1 male case (0.6%) and 2 female cases (1.1%), with 38 years old as the maximum age and 14 as the minimum. According to (**Grimm & Chamberlain et al., 2009**), gliomas account for 80% of spinal cord tumors, with Astrocytoma making for 30% to 40% of cases[12].

Three cases of Ependymoma (12%) with a minimum age of eleven and a maximum age of twenty-three were identified in our investigation; two of the cases (1.1%) were male, and one of the cases (0.6%) was female. A study found that gliomas account for 80% of spinal cord tumors, with 60–70% of these being ependymomas[12].

In our study, only two (8%) female patients were diagnosed with Schwannoma. One was thirty years old, and the other was twenty-one. According to an Indian investigation, 8 (5.2%) of the tumors that were revealed to be Schwannoma were spinal tumors, which is higher than our study[8].

In this investigation of spinal cord malignancies, one (4%) case of metastatic neoplasia was also discovered; the patient was a 62-year-old woman. Since all pertinent immunohistochemistry results were negative, an exact diagnosis cannot be made. Study by **Shrestha et al., 2020,** found that throughout the 8-year trial, 3.38% of patients with CNS tumors developed metastatic tumors; this number is greater than our study due to the extended study length, and they have included all CNS tumors[8].

An uncommon and severely epileptogenic tumor, Ganglioglioma (GG) accounts for around 1.3% of primary brain tumors[13]. One (4%) Ganglioglioma in the spinal cord was discovered in the current investigation; the patient was a 7-year-old male. Since tumors are uncommon, no study was found to support the association.

According to the current investigation, one 45-year-old female patient with Neurofibroma (4%) had spinal cord involvement. The research discovered that 6 (3.9%) of the spinal tumors had a diagnosis of Neurofibroma[8].
Intracerebral mesenchymal tumors make up less than 0.16% of all intracranial cancers. Chondrosarcomas[14]. **Orguc, Arkun, et al. (2014)** found 3-12% of chondrosarcomas originate in the spine[15]. A 30-year-old female patient with a single (4%) case of Chondrosarcoma has been found among spinal cord malignancies in this study. The diagnosis is solely based on histopathology; no association was found using radiological films or clinical data.

CONCLUSION

The most common spinal cord cancers identified in the study were meningiomas, accounting for 52%, followed by astrocytomas and ependymomas, each representing 12%. The findings suggest that spinal tumors are more frequently observed in adolescents and adults, with a higher incidence in women compared to men; this highlights the need for further research into gender and age-related factors contributing to the development of spinal cord cancers.

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AUTHOR CONTRIBUTION
Bashir P: Devised the idea and wrote the manuscript.
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Shahzad H: Tabulation and proofreading
Jalbani A: Editing, statistics and data collection.
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