Trends in Clinical and Medical Sciences

PSR Press

Original Research Article

Primary intracranial tumours- A five year hospital based cross-sectional study

Inumella Suvarna[1,*], Ghorpade Raviraj[2], Malur R Prakash[3] and Bannur Hema[4]

1 Assistant Professor, JN Medical College, KAHER & Consultant and Incharge Pathologist, Hi Tech Lab, KLE's Dr Prabhakar Kore Hospital and MRC, Belgaum.
2 Consultant Neurosurgeon, KLE's Dr PK Hospital and MRC, Belgaum.
3 Professor, Jawaharlal Nehru Medical College, KAHER, Belgaum & Consultant Pathologist Hi Tech Lab, KLE's Dr PK hospital, Belgaum.
4 Professor in Pathology, JN Medical College, KAHER, Belgaum.
* Correspondence: suvarna.inumella@gmail.com

Received: 29 October 2022; Accepted: 1 April 2023; Published: 17 April 2023.

Abstract: Primary brain tumors are a major cause of cancer-related deaths worldwide, and numerous studies have indicated an increase in their incidence over the past two decades. This study aimed to estimate the frequency of primary intracranial tumors presenting at KLE's DR Prabhakar Kore's Hospital and MRC, Belgaum, and to examine correlations between various factors, including age, sex, clinical symptoms, and signs. Between January 2006 and December 2010, 159 patients with proven cases of primary intracranial tumour based on CT/MRI scans were included in the study. Gliomas were the most frequent tumor type (45.28%), followed by meningiomas (23.89%). Males were more commonly affected (55.97%) than females, and the most commonly affected age group was 41-60 years, including 74 of the 159 cases (46.65%). Over half of the tumors were located in the cerebral lobes, with the frontal lobe being the most frequently involved. Headaches, seizures, and focal neurologic deficits related to the anatomic site of involvement were the most common presenting signs and symptoms. The findings of this study can be extrapolated to the population of North Karnataka and are consistent with similar studies conducted elsewhere in the country. Additionally, the study reveals a significant relationship between patient age and sex and the occurrence of different tumor types.

Keywords: Primary intracranial tumours; Brain tumours; CNS tumours.

1. Introduction

Primary brain tumours are a significant public health concern worldwide, being among the top ten causes of cancer-related deaths. Many studies conducted globally have suggested that there has been an increase in the incidence of brain tumours over the last two decades. In the United States, the incidence rate of all primary malignant and non-malignant brain tumours is 20.6 cases per 100,000 persons, with an estimated 69,720 new cases of primary brain tumours expected to be diagnosed in 2013 alone. The incidence rate of childhood primary brain tumours in the United States is 5.1 cases per 100,000 persons [1].

The epidemiology of brain tumours has been studied extensively in developed countries like the USA, where cancer registries have provided a better understanding of the incidence and mortality rates of different types of brain cancers. However, there is a need for systematic epidemiological studies in developing countries like India, where the incidence rates and patterns of brain tumours may differ due to genetic and environmental factors, lifestyle and dietary habits, and healthcare access and utilization [2,3].

In this context, we conducted a study to estimate the frequency of primary intracranial tumours presenting at KLE'S DR Prabhakar Kore's hospital and MRC, Belgaum, and to correlate them with factors such as age, sex, clinical symptoms, and signs. The aim of this study was to provide insights into the epidemiology of primary brain tumours in the North Karnataka region of India and to compare our findings with those of similar studies done elsewhere in the country [4].

In this study, we included patients presenting between January 2006 and December 2010, whose CT/MRI scans were proven cases of primary intracranial tumour. We analysed the data on the frequency and distribution of different types of primary intracranial tumours, such as gliomas, meningiomas, and others, and their association with age, sex, and clinical features. Our findings showed that gliomas were the most frequent tumours, followed by meningiomas, and that males were more commonly affected than females. The most commonly affected age group was 41-60 years, and more than half of the tumours occurred in the cerebral lobes, with the frontal lobe being the most frequently involved.

In conclusion, our study provides valuable insights into the epidemiology of primary intracranial tumours in the North Karnataka region of India. Our findings are consistent with similar studies done elsewhere in the country and highlight the need for further research to explore the underlying risk factors and mechanisms involved in the development of brain tumours. Understanding the epidemiology of brain tumours is essential for developing effective prevention and treatment strategies to reduce the burden of this disease on individuals and society.

2. Materials and Methods

This study was conducted prospectively from January 2008 to December 2010 and retrospectively between January 2006 and December 2007, and included patients who presented to KLE's Dr PK hospital during this period.

For the prospective study, patients who were suspected of having brain tumours based on their CT or MRI scan were followed up to confirm their histopathological biopsy. Only proven cases of primary intracranial tumours were included in the study, while metastatic tumours were excluded. Tumour tissues were fixed in 10% neutral buffered formalin, processed routinely, embedded in paraffin, cut into thin sections, and stained with hematoxylin and eosin (H&E). Special stains such as Glial Fibrillary Acid Protein (GFAP) were used to aid in diagnosis.

For the retrospective study, we traced cases from histopathology records. The biopsies of known cases of primary intracranial tumours were extracted, sections were cut, and stained in the aforementioned manner. The slides were reviewed again, and diagnoses were confirmed.

Clinical data, CT and MRI findings were obtained from patient records. Immunohistochemistry was used to diagnose some of the morphologically difficult tumours. The 2007 WHO classification and grading was followed for typing tumours [2]. The data was then systematically analysed to obtain the frequency of different tumours. The relationship between different tumours and the age and sex of the patients, various modes of presentation, and the site of the brain involved were also noted and analysed.

3. Results

3.1. Frequency

A total of 159 confirmed cases of primary brain tumors were detected in our center during the five-year study period from January 2006 to December 2010, with 72 of the 159 cases being gliomas, making them the most frequently occurring tumors (45.28%). The second most common tumors were meningiomas comprising 38 cases (23.89%). The other tumors diagnosed included 17 schwannomas, 15 pituitary adenomas, 8 craniopharyngiomas, 7 medulloblastomas, and one case each of rare tumors, including Pineoblastoma, Dysembryoplastic Neuroepithelial Tumor (DNT), and choroid plexus papilloma (Table 1). Among gliomas, astrocytomas were the most common tumors (77.78%). The second most common were oligodendrogliomas (18.05%). The rare subtypes included 2 ependymomas and 1 mixed oligoastrocytoma (Table 2). Among meningiomas, the most common histological subtype was meningothelial meningioma (Table 3). Eleven percent of tumors occurred in the age group of 0 to 18 years in the present study. Of these, astrocytomas were the most common tumors, comprising 36.36% of all childhood tumors, followed by medulloblastomas, which made up to 18.18%. Pineal tumors, DNTs, and ependymomas each made up to 9.09% of all tumors in this age group.

3.2. Age incidence

The most commonly affected age group in our study was 41-60 years, including 74 of the 159 cases (46.65%). A total of 51 cases were in between 19-40 years of age, which is the second most commonly affected age group (32.07%). There were 17 cases each in both the <19 years and >60 years age groups. These figures suggest that the incidence of CNS tumors increases progressively from childhood through adolescence to peak in adulthood, and thereafter it drops again to about 10% in the older patients of more than sixty years of age (Table 4).

3.3. Sex incidence

In general, males were more commonly affected (55.97%) in our study compared to females (Table 5). Gliomas, especially the high-grade tumors, showed a clear male preponderance (74.71%) as compared to the female group. The grade-1 and grade-2 gliomas, on the other hand, were seen more commonly in females. The cause for this pattern of occurrence is not understood; however, it is well-documented in the literature. Meningiomas, which are known to have a female preponderance, were more common in males in the present study. The reason for this is not known. However, the authors think that it is due to the relatively fewer number of cases encountered in our study.

3.4. Tumor grade

High-grade gliomas were more common, with a frequency of 45 out of 72 cases (62.50%), than low-grade tumors (Table 6). In children, however, although gliomas were the dominant tumors, they were mainly low-grade astrocytomas, implying that the grade increased with increasing age of the patients. Most meningiomas were benign, except for one case of atypical meningioma, which showed increased cellularity, atypia, and plenty of mitoses.

3.5. Tumor site

Around 55% of the tumors, mainly gliomas, occurred in the cerebral lobes, with the frontal lobe being the most frequently involved (Table 7). The other common sites involved include the sella turcica and CP angle, which are the sites of pituitary adenoma and schwannoma, respectively. The falx, foramen magnum, and pterional region were rarely involved sites (mainly meningiomas). The cerebellum was the common site for medulloblastomas.

3.6. Clinical features

The study results showed that headache was the most frequent presentation of brain tumors, and more than half the patients (56.60%) presented with a headache as at least one of the symptoms (Table 8). The other common symptoms included vomiting, convulsions, visual disturbances, and focal neurological deficits.

Table 1. Frequency distribution of primary intra-cranial tumours in KLE's DR PK Hospital

SL NO	TUMOUR TYPE	NO . OF CASES	% OF TOTAL
1	Gliomas	72	45.28
2	Meningiomas	37	23.27
3	Schwannomas	17	10.69
4	Pituitary adenomas	15	09.43
5	Craniopharyngiomas	08	05.03
6	Medulloblastomas	07	04.40
7	DNT s	01	00.62
8	Pineoblastomas	01	00.62
9	Choroid plexus pappiloma	01	00.62

Table 2. Freq uency distribution of different subtypes of gliomas in KLE's DR PK Hospital

Glioma sub- type	No. of cases	% Of all gliomas
Astrocytomas	56	77.78
Oligodendrogliomas	13	18.05
Ependymomas	02	02.78
Oligoastrocytomas	01	01.38
Total	72	100.00

Table 3. Frequency distribution of different subtypes of meningiomas in KLE's DR PK Hospital

Meningioma sub-type	No. of cases	% Of all meningiomas
Meningothelial	19	51 .35
Angiomatous	07	18.91
Fibrous	03	08.10
Psammomatous	03	08.10
Transitional	03	08.10
Microcystic	01	02.70
Atypical	01	02.70
Total	37	100.00

Table 4. Age -specific distribution of primary intra-cranial tumours in KLE's DR PK Hospital

Age group (In years)	No. of cases	% Of total
0-18	17	10.69
19-40	51	32.07
41-60	74	46.54
>60	17	10.69
Total	159	100.00

Table 5. Sex-specific distribution of primary intra-cranial tumours in KLE's DR PK Hospital

Tumour	Total	Males	%	Females	%
Gliomas	72	45	62.50	27	37.50
Meningiomas	37	22	59.46	15	40.54
Schwannoma	17	07	41.18	10	58.82
PAs	15	07	46.67	08	53.33
Craniopharyngiomas	08	05	62.50	03	37.50
MDBs	07	03	42.86	04	57.14
DNT	01	00	-	01	100.00
Pineoblastoma	01	00	-	01	100.00
Choroid plexus papilloma	01	00	-	01	100.00
Total	159	89	55.97	70	44.03

Table 6. Frequency distribution of different grades of gliomas in KLE's DR PK Hospital

Grade	No. of cases	% Of all gliomas
Low-grade(I &II)	27	37.50
High-grade(III & IV)	45	62.50
Total	72	100.00

Table 7. Frequency distribution of different sites of primary intra-cranial tumours in KLE's DR PK Hospital

SL No.	Site	**No.**	**%**	**SL No.**	**Site**	**No.**	**%**
1	Cerebral lobes	88	55.34	7	Falx	03	01.89
2	Sella	23	14.46	8	Foramen Magnum	03	01.89
3	CP angle	16	10.06	9	Pterional region	02	01.26
4	Cerebellum	13	08.17	10	Pons	01	00.62
5	Ventricles	05	03.14	11	Tentorium	01	00.62
6	Trigeminal nerve	03	01.89	12	Thalamus	01	00.62

Table 8. Frequency distribution of different symptoms of primary intra-cranial tumours in KLE's DR PK Hospital

SL No.	**Symptom**	**No.**	**%**	**SL No.**	**Symptom**	**No.**	**%**
1	Headache	90	56.60	7	Giddiness	31	19.50
2	Vomiting	45	28.30	8	Altered consciousness	27	16.98
3	Convulsions	43	27.04	9	Speech disturbances	21	13.20
4	Visual disturbances	40	25.15	10	Sensory disturbances	19	11.95
5	Gait disturbances	38	23.90	11	Amenorrhea	06	03.77
6	Motor weakness	38	23.90	12	Others	8	05.03

4. Discussion

The present study provides important insights into the prevalence of brain tumors in our region. The findings suggest that gliomas are the most common brain tumors, accounting for 62.5% of cases, followed by meningiomas at 15.3%. These results are consistent with previous studies in India, which have reported a high incidence of gliomas in different regions of the country [3,4].

Interestingly, our study found that the majority of cases occurred in the 40-60 year age group, whereas a similar study conducted at Tata Memorial Hospital in Bombay reported a higher incidence in the 19-40 year age group [4]. This difference may be attributed to environmental factors specific to these regions, such as pollution or lifestyle differences. Further research is required to determine the underlying causes of this difference.

In addition, the study revealed that the frontal lobe was the most commonly affected site in the brain, with gliomas being the predominant tumor type in this region. This finding is consistent with previous research that has identified the frontal lobe as a common site for gliomas.

The clinical presentation of brain tumors can vary widely, and our study found that headache was the most common symptom, followed by vomiting, convulsions, visual disturbances, and focal neurological deficits. These findings highlight the importance of considering brain tumors in the differential diagnosis of patients presenting with these symptoms.

Overall, our study provides important information about the prevalence and characteristics of brain tumors in our region. The findings will help to guide clinical management and research efforts aimed at improving outcomes for patients with these tumors.

Table 9. Comparison of incidence of primary CNS tumours of KLE's DR PK Hospital with Kolkata

Tumour type	**KLEs DRPK Hospital, Belgaum**	**Kolkata**
Gliomas	**45.28**	**60.03**
Meningiomas	23.27	11.63
Craniopharyngiomas	05.03	05.48
Pituitary adenomas	09.43	04.14
pineoblastomas	00.62	0.27
Medulloblastomas	04.40	0 1.06

Table 10. Comparison of age - specific distribution Inkle with TMH, Bombay

Study	0-18 yrs	19-40 yrs	41-60 yrs	>60 yrs
DR PK Hospital Belgaum	10.69%	32.07%	46.54%	10.69%
TMH, Bombay	22.00%	36.30%	32.80%	09.00%

5. Conclusion

The present study aimed to investigate the incidence pattern of primary intracranial tumors in the North Karnataka region, focusing on patients presenting at KLE's DR PK hospital. Our study identified nine different tumor types, with gliomas being the most common, and glioblastoma being the most common subtype. High-grade gliomas were more prevalent than low-grade tumors. The most affected age group for all tumors was 41-60 years, and males were more commonly affected than females. The tumors were primarily located in the cerebral lobes, with the frontal lobes being the most frequently affected. The majority of patients presented with headaches as one of the symptoms.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: "Authors declare that they do not have any conflict of interests."

References

[1] Central Brain Tumor Registry of the United States analyses of the NPCR and SEER data, 2005-2009.

[2] Louis, D. N., Ohgaki, H., Wiestler, O. D., Cavenee, W. K., Burger, P. C., Jouvet, A., ... & Kleihues, P. (2007). The 2007 WHO classification of tumours of the central nervous system. *Acta Neuropathologica, 114*(2), 97-109.

[3] Ghosh, A., Sarkar, S., Begum, Z., Dutta, S., Mukherjee, J., Bhattacharjee, M., ... & Chaudhuri, S. (2004). The first cross sectional survey on intracranial malignancy in Kolkata, India: Reflection of the state of the art in Southern West Bengal. *Asian Pacific Journal of Cancer Prevention, 5*(3), 259-267.

[4] Jalali, R., & Datta, D. (2008). Prospective analysis of incidence of central nervous tumors presenting in a tertiary cancer hospital from India. *Journal of Neuro-oncology, 87*(1), 111-114.