Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-95 (p) ISSN Print: 2348-6805

Original Research

Descriptive Epidemiology of Primary Brain Tumors from North-Western India-Single institute study

[1]Dr. Praveen Kumar, [2]Dr. Rajesh Kumar, [3]Dr. Neeti Sharma, [4]Dr. H.S Kumar, [5]Dr. Kamlesh Harsh Kumar, [6]Dr. SR Jakhar

[1]Third Year Resident, [2]Medical Officer, [3]Senior Professor and HOD, [4]Senior Professor, [5]Associate Professor, [6]Professor

Department of Radiotherapy, SP Medical College, Bikaner, Rajasthan, India

ABSTRACT:

Brain tumors are a mixed group of neoplasms that originate from the intracranial tissues and the meninges with degrees of malignancy varying greatly from benign to aggressive. Not much is known about the epidemiology of primary malignant brain tumors (PMBTs) in our population in North-East India. In this analysis, an attempt was made to identify the age groups, gender distribution, topography and different histological types of PMBT with data from a hospital cancer registry. A total of 1025 cases of PMBT were identified and included for the present analysis. Our analysis has shown that most of PMBT occur at 19-60 years of age, with a male to female ratio of 1.88:1. Some 70.5% of cases occurred in cerebral lobes except for the occipital lobe, and astrocytic tumors were the most common broad histological type. In our population the prevalence of PMBT is 1.23% of all cancers, mostly affecting young and middle aged patients. As brain tumors are rare, so case-control analytic epidemiological studies will be required to establish the risk factors prevalent in our population.

Keywords: Primary Brain Tumors/PBT, epidemiology, North-East India , risk factors

Received: 15 April, 2021 Accepted: 20 May , 2021

Corresponding author: Dr. Neeti Sharma, S. Professor and HOD, Department of Radiotherapy, SP Medical College, Bikaner, Rajasthan, India

This article may be cited as: Kumar P, Kumar R, Sharma N, Kumar H.S, Kumar KH, Jakhar SR. Descriptive Epidemiology of Primary Brain Tumors from North-Western India-Single institute study. J Adv Med Dent Scie Res 2021;9(6):175-180.

INTRODUCTION

The term brain tumors referred to a mixed group of neoplasms that originates from the intracranial tissues and the meninges with degrees of malignancy varying from benign to aggressive[1]. Malignant neoplasms in the brain are mostly metastatic and primary malignant brain tumors (PMBT) are relatively uncommon[2]. The South Central Asia region including India has an incidence of 1.5 and 0.7/one lac/year in males and females respectively[3]. In the Indian population there has been an rising trend in the cancers of central nervous system in both males and females (Yeole, 2008)[4]. The established risk factors for PMBTs are genetic (P-53 mutation, Li-Fraumeni cancer family syndrome etc) and ionizing radiations. However, the results of epidemiologic studies on radiofrequency exposures (mobile phones), low frequency magnetic fields and immune factors like viruses, allergies etc are not convincing for establishing their link with PMBT (Mckinney , 2004).[5]

There are several clinico-pathological entities of PBTs. In this brief retrospective analysis, we had tried to identify the age groups, gender distribution, topography and different histological types of PMBT of our population. Although a population based data would have shed light on the real picture of epidemiology of PMBT of our population, as advocated by Nasir et al., (2010)[6]. However, our hospital based study can define the pattern of PMBT prevalent in our population.

MATERIALS AND METHODS

The data on PMBT was obtained from the data base of our hospital cancer registry in the North-Eastern India. The data set consisted of information of 82832 patients with cancer that was registered during the period of January 2011 to December 2019. Strict

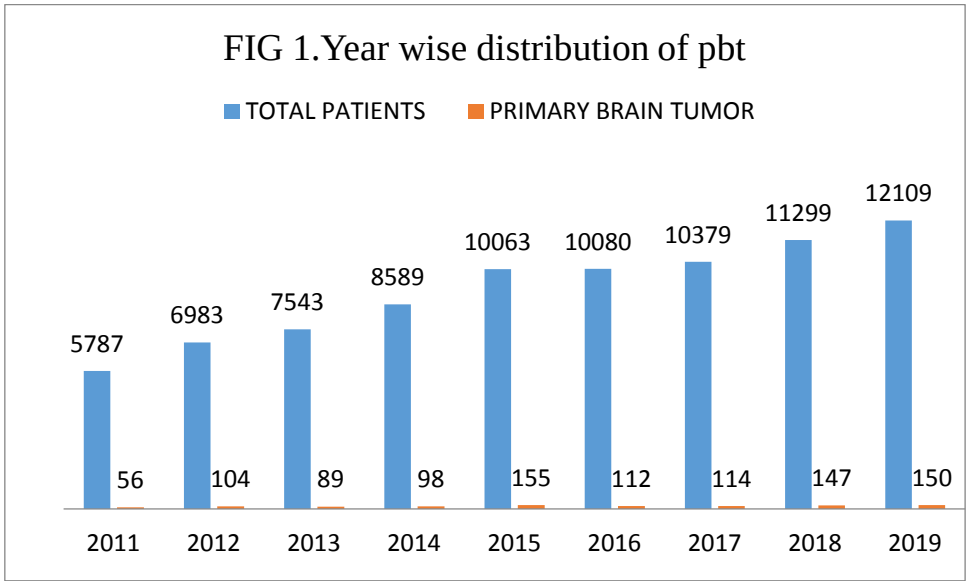
confidentiality of patient information was maintained while handling the data sets. The topography of PMBT were identified by the coding according to international statistical classification for disease (ICD-10, C71.0-9) and histopathological type of PMBT was identified by international statistical classification of diseases for oncology, 3rd revision (ICD- 0-3) coding[7,8]. Our analysis did not include the data of spinal cord tumors, lymphomas and germ cell tumors.

RESULTS

A total of 1025 cases of PMBT were identified. There were 669 males and 356 female patients. The year wise percentage of PMBT were ranged from 0.94 to 1.54, lowest in 2011 while highest in 2015(Table 1).

TABLE 1. YEAR WISE DISTRIBUTION OF PRIMARY BRAIN TUMORS(PBT)

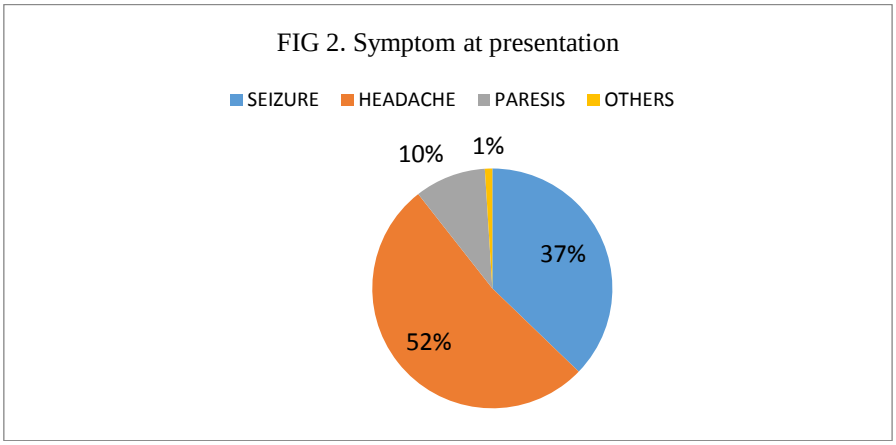
	2011	2012	2013	2014	2015	2016	2017	2018	2019
TOTAL PATIENTS	5787	6983	7543	8589	10063	10080	10379	11299	12109
PBT(%)	56(.97)	104(1.45)	89(1.17)	98(1.14)	155(1.54)	112(1.11)	114(1)	147(1.3)	150(1.23)



Commonest symptom at presentation was headache followed by seizure and paresis (Table 2).

TABLE 2 SYMPTOMS AT PRESENTATION

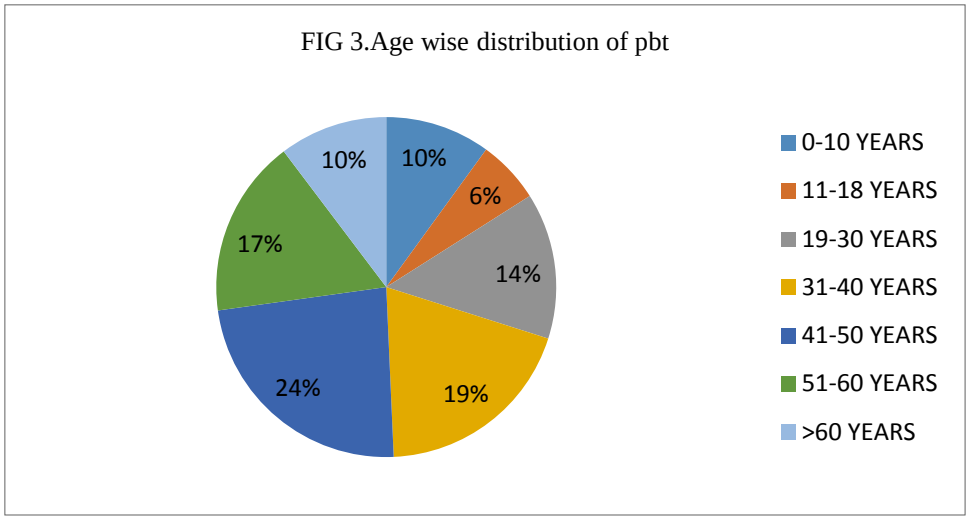
SYMPTOM	SEIZURE	HEADACHE	PARESIS	OTHERS
NUMBERS (%)	381 (37.2)	535(52.2)	98(9.6)	11(1)



The age of patients ranged from 1 year to 84 years. The median age of males was 34 years and in females it was 31.5 years. The highest number of patients was seen in the age-group of 31-50 years in both males and females ie, 42.9% (Table 3).

TABLE 3. AGE DISTRIBUTION

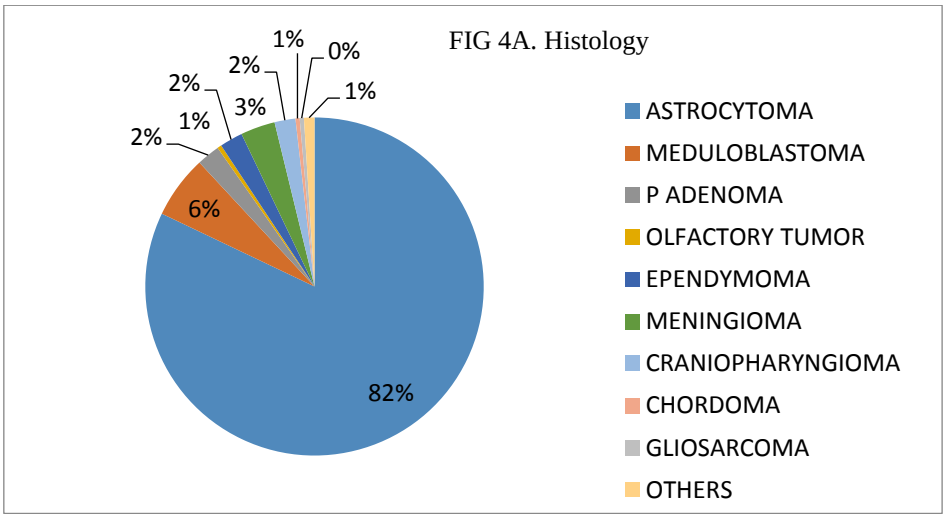
AGE GP	0-10	11-18	19-30	31-40	41-50	51-60	>60
NUMBERS (%)	102(10)	62(6)	142(13.9)	199(19.4)	241(23.5)	173(16.9)	106(10.3)



Histological types were classified according to WHO classification (Louis et al., 2007)[7,8]. The main histological sub types were astrocytoma in 82% (840/1025), medulloblastoma in 6% (62/1025), meningioma 3.3%, pituitary adenoma 2.8% and ependymoma 2.2%. Out of all astrocytoma grade I-II were 30.2%(254/840), grade III 22.5%(189/840), and grade IV(glioblastoma multiforme) in 38.2% (321/840) patients (Table 4).

TABLE 4. HISTOLOGY

ASTROCYTOMA	840 (82%)
MEDULOBLASTOMA	61 (6%)
P ADENOMA	23 (2.2%)
OLFACTORY TUMOR	04 (0.4%)
EPENDYMOMA	23 (2.2%)
MENINGIOMA	34 (3.3%)
CRANIOPHARYNGIOMA	21 (2%)
CHORDOMA	04 (0.4%)
GLIOSARCOMA	04 (0.4%)
OTHERS	11 (1%)
ASTROCYTOMA G I-II	254 (30.2%)
ASTROCYTOMA G III	189 (22.5%)
ASTROCYTOMA G IV	321 (38.2%)
NO GRADING	76 (9%)



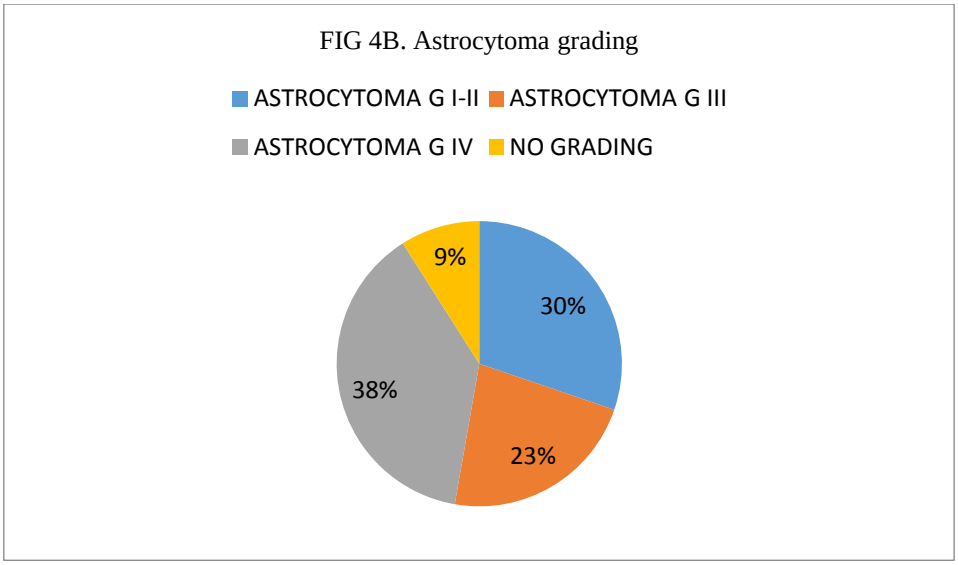


FIG 4B. Astrocytoma grading

The anatomic sub sites of PMBT were on frontal, temporal and parietal lobes in 53.9% of cases as shown in Table 5.

TABLE 5. TOPOGRAPHICAL DISTRIBUTION

SITE OF PBT	
FRONTAL LOBE	261 (25.5%)
TEMPORAL LOBE	106 (10.3%)
PARIETAL LOBE	186 (18.1%)
CEREBELLUM	78 (7.6%)
BRAINSTEM	14 (1.4%)
OVERLAPPING LESION	209 (20.4%)
NOS	171 (16.7%)

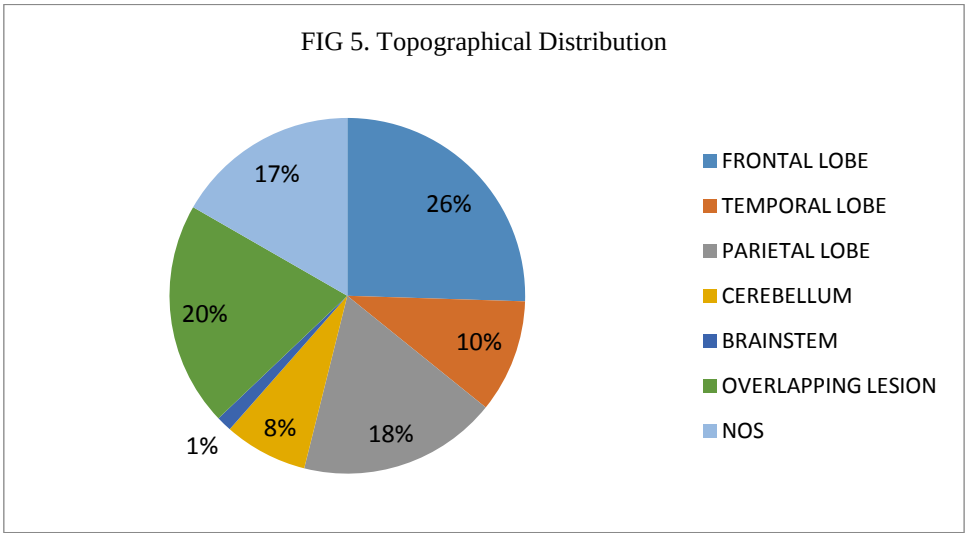


FIG 5. Topographical Distribution

DISCUSSION

The incidence of brain tumors has been reported to be around 3.9 and 3.2 /one lakh/year in males and females respectively (Ferlay et al., 2010)[1].The age adjusted incidence rates (AAR) of malignant brain tumors in our population is not significant. In the population covered by our hospital cancer registry, the age adjusted incidence rates of brain and CNS tumors are low compared to the AAR of other registries of India (Manoharan et al., 2012)[3]. Literature suggests the prevalence of malignant brain tumors to be around 1-2% of adult cancers (Wrensch et al., 2002; Mckinney, 2004)[5].

Our analysis has shown that the prevalence of PMBT was around 1.23% (1025/82832) of all cancers in our population. In this study, males were over twice

affected (M:F=1.88:1) than females. Our analysis has shown that most of PMBT occurs at 19-60 years of age (60-62% of cases) and with advancing age (above 60 years) there was a decline in the numbers of patients. Also, the common anatomic sites for the development of PMBT in our population were centred on the cerebral lobes. Most of the times PMBT involves adjacent cerebral lobes, so it is imperative to present the anatomical sub sites based on the combined involvement of cerebral lobes.

Age and anatomic locations are few clinical criteria's to assess the prognosis of brain tumors (Louis et al., 2007)[8]. Considering age and topography of PMBT, significant numbers of patients in our analysis were in the favourable set for survival. At times when the PMBT is diagnosed by radiological methods only due to poor health, non compliance and inoperability etc, the histological types is not available for registry purpose.

From this analysis, in our population the main histological types of PMBT were astrocytic tumors followed by embryonal tumors. This finding is similar to the one published in the literature on brain tumors in children (Jain et al., 2011)[9]. Previous studies have shown a decline in rates of low grade gliomas, like astrocytoma in the developed societies, but an increase on the overall brain cancers (Wrensch et al., 2002; Hess, 2004)[10, 11]. With increase in the use of mobile phones, an area of interest for epidemiological research on brain tumors is the possible association of radio frequency (RF) radiation ie, radiation emitted by mobile phones. However, the results on cellular effects of RF radiation do not hold much of biological plausibility and were not convincing for association of RF radiation (Barchana et al., 2012)[12].

Jazayeri et al. (2013) has shown that cancer registries should also include benign brain tumors for a better understanding of the epidemiology of brain tumors as a whole[13]. Our hospital cancer registry maintains electronic records (proforma) of benign as well as malignant lesions of the brain.

In our population the prevalence of PMBT is 1% of all cancers, mostly affecting young and middle aged patients, and adult males are more affected with PMBT. However, in children, females were more affected. A systematic review by Qin et al. (2014) has shown that genetic polymorphism may increase the risk of brain tumors[14]. Case-control study on small number of patients with brain tumors have shown altered expression of xenobiotic metabolizing genes (Wahid et al., 2013)[15]. Brain tumors are rare, so case-control analytic epidemiological studies will be required to establish the risk factors prevalent in our population. Frontal lobe was the most common site of brain tumours in our study. Trabelsi S et al., Zahir ST et al., and Krishnatreya M et al., also observed frontal lobe as the commonest site of brain tumours [16-18].

CONCLUSION

Primary central nervous tumors are rare heterogenous group of neoplasm with wide histopathological spectrum and varying clinical outcome. As a single institute based study has limited usage and not representing the national epidemiological data. Another drawback is our centre is a government hospital which caters the poor socioeconomic patients limiting the numbers included. To overcome these limitations a thorough nationwide pan hospital based registry to be developed for a large brain tumor data based study of epidemiology and etiology of primary brain tumor.

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