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EVALUATION OF PRIMARY CNS TUMORS IN A SAMPLE OF IRAQI PATIENTS CLINICOPATHOLGICAL STUDY

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ABSTRACT

Introduction: Primary brain tumors include tumors that originate from the tissues of the brain or the brain's immediate surroundings. Primary tumors are categorized as glial (composed of glial cells) or non-glial (developed on or in the structures of the brain, including nerves, blood vessels and glands) and benign or malignant. Glioma and meningioma are the most commone types. **Aim of study:** To assess the frequency of different types of primary CNS (central nervous system) tumors in Bagdad medical city and to assess the relation with age, gender and clinical symptoms. **Subject and method:** A retrospective analysis of 60 randomly selected patients with primary brain tumor collected from Teaching Laboratories of Baghdad Medical City from January 2019 to January 2020. The data collection will include:- Demographic analysis (age, residency and gender). Clinical presentation (include persistent headache, seizures, nausea, vomiting, neurocognitive symptoms, and personality changes….ect). Post-operative histopathological diagnosis. Data will be collected from patient archived pathological report. Then statistical analysis will be done to assess frequency of different types of primary brain tumors and their clinicopathologicl parameters. **Results:** During this study the total number of collected cases is 60,there were 40 (66.66%) diagnosed as glioma and meningioma, headache was the most common clinical presentation 18 (30%), Male predominance, the age of patient range from 0-74 years ,the highest primary CNS tumor (48.33%) was found in patients between 15-49 years old. **Conclusion:** In this study I found that meningioma and glioma (astrocytoma) are the most common type of primary CNS tumor. Headache is the most clinical presentation, male predominance. the highest primary CNS tumor (48.33%) was found in patients between 15-49 years old. because our country considered a high reproductive country and low average age in general.

KEYWORDS: Primary CNS tumors, meningioma, astrocytoma, headache, Gender distribution in primary CNS tumor.

INTRODUCTION

Primary brain tumors include any tumor that arises from the brain structures. Primary brain tumors are rare and account for 2 % of all cancers.

The annual incidence of CNS tumor ranges from 10 to 17 per 100,000 persons for intracranial tumors and 1 to 2 per 100,000 persons for the intraspinal tumors, the majority of these are primary tumors. and only one fourth to one half are metastatic. Tumors of the CNS account nearly 20% of all cancers of childhood. 70% of childhood CNS tumors arise in posterior fossa, a comparable number of tumors in adults arise within the cerebral hemispheres above tentorium. While pathologists have developed classification schemes that distinguish between benign and malignant lesions on histologic grounds clinical course of a patient with a brain tumor is strongly influenced by patterns of growth and location. for that, some glial tumors with low grade histologic features (low mitotic activity, cellular uniformity, and slow growth) infiltrate large regions of the brain and lead to serious clinical deficits and poor prognosis. Because of this capacity to diffusely infiltrate the white and gray matter, the tumor may not be amenable to complete surgical resection without compromising neurologic function. Also, any CNS neoplasm, regardless of its histologic grade or classification, may have lethal consequences if situated in a critical brain region, for example, a benign meningioma may cause cardiorespiratory arrest if situated in the posterior fossa in a position to compress vital centers in the medulla. Even the most highly malignant gliomas rarely metastasize outside the CNS.

Tumors are able to spread through the CSF (cerebrospinal fluid) if they encroach upon the sub arachnoid space, and this may be associated with implantation along whole brain and spinal cord at a distance from the original tumor site.

Classification of tumors is one of the arts of pathology, making on traditional recognition of histologic and bio logic features. Treatment protocols and experimental trials of glial tumors are usually based on the World Health Organization (WHO) classification. Which segregates tumors into one of four grades according to their biologic behavior, ranging from grade I to grade IV. Under the current classification scheme, lesions of different grade are always given distinct names. When tumors recur, they often show progression to a higher histologic grade and designation, this actually represents clonal evolution of the same tumor, rather than a new disease.

There is great interest in identifying tumor initiating (or stemlike) cells that maintain tumor growth and, for that, this may be the key targets of new therapeutic modalities. The major classes of primary brain tumors to be considered include gliomas, neuronal tumors, poorly differentiated tumors, and a group of other less common tumors. In addition, tumors of the meninges as well as familial tumor syndromes.[1]

The cellular composition of brain, spinal cord, and their coverings are addressed to the current nosology of primary neoplasms arising in these locations Confined within the cranium and vertebral canal, the CNS is sheathed by connective tissue membranes that include a collagenous outer covering termed dura mater and delicate inner investments known as the leptomeninges or pia-arachnoid border cells that are easily disrupted to yield a ‘subdural space A sagittal dural fold referred to as the falx cerebri lies between the cerebral hemispheres, a second such fold – the tentorium cerebelli – separating the superior cerebellar surfaces from the overlying temporal lobes of the cerebrum. in addition to meningeal artery branches, venous sinuses that serve both to drain the cerebral veins and carry away cerebrospinal fluid (CSF) transported from subarachnoid space by arachnoid villi that project into these conduits they achieve grossly visible proportions with normal aging, these villi are draped by specialized arachnoidal cells of interest to surgical pathologists as the likely progenitors of the meningioma, a common, dura-based neoplasm. Whereas the dura adheres tightly to the endosteal surfaces of the skull, at spinal levels it is attached only anteriorly to the vertebral bodies and is surrounded on its lateral and posterior aspects by a true compartment (the epidural space) which contains segments of the spinal nerve roots, blood vessels, and a very modest amount of adipose tissue.

Within CNS, connective tissue is scant and essentially restricted to the adventitia of blood vessels no lymphoid elements. The parenchyma of the brain and spinal cord is composed principally of the bodies and cytoplasmic processes of neuroepithelial cells, including neurons and various classes of glia supporting astrocytes, myelinating oligodendrocytes, and ependymal cells that line ventricular surfaces, These all have their neoplastic counterparts, classified generically as gliomas and then subclassified as astrocytomas, oligodendrogliomas, and ependymomas, respectively.

Meningioma form an intra-axial mass but looms large if the lesion in question is dura-based or fills cerebellopontine angle by contrast, astrocytomas of diffuse fibrillary type, oligodendrogliomas, and metastatic carcinoma account for most cerebral hemispheric tumors particularly in adulthood

Pilocytic astrocytomas, mainly affect young persons whereas ependymomas frequent affect children and the spinal cords of adults Primary CNS lymphomas are most often situated within deep, periventricular white matter structures or the basal ganglia, whereas germ cell tumors only exceptionally arise outside of a midline the tapering conus medullaris and filum terminale of the distal spinal cord are the nearly exclusive hosts of myxopapillary ependymomas and CNS paragangliomas.[2]

Primary brain tumors are classified based on their cellular origin and histologic appearance, radiation is proven environmental risk factor for a brain tumor.

Typical symptoms include persistent headache, seizures, nausea, vomiting, neurocognitive symptoms, and personality changes, any patient with chronic, persistent headache in association with protracted nausea, vomiting, seizures, neurologic symptoms should be evaluated for a brain tumor.

A comprehensive neurosurgical evaluation is necessary to obtain tissue for diagnosis and for possible resection of the tumor. Primary brain tumors rarely metastasize outside the central nervous system, Surgical resection of the tumor is the mainstay of therapy.[3]

Risk factors

Several central nervous system (CNS) tumors are associated with rare genetic conditions, most commonly the autosomal dominant disorder neurofibromatosis 1. Patients with this disorder have a number of dermatologic manifestations and are at increased risk of optic gliomas and astrocytomas. Although several environmental factors have been associated with brain tumors, exposure to high-dose ionizing radiation considered an important risk factor.

There are studies of other environmental factors such as occupational exposures, electromagnetic fields, pesticides, cellular telephones, head trauma.[3]

WHO Classification of Primary Brain Tumors

- Neuroepithelial tumors
- Astrocytic tumors
- Pilocytic astrocytoma (grade I)
- Subependymal giant cell astrocytoma (grade I)
- Diffuse astrocytoma (grade II)
- Pleomorphic xanthoastrocytoma (grade II)
- Anaplastic astrocytoma (grade III)

- Glioblastoma (grade IV)
- Oligodendroglial tumors
- Oligodendroglioma (grade II)
- Anaplastic oligodendroglioma (grade III)
- Oligoastrocytic tumors
- Oligoastrocytoma (grade II)
- Anaplastic oligoastrocytoma (grade III)
- Ependymal tumors (grades I to III)
- Choroid plexus tumors (grades I to III)
- Other neuroepithelial tumors:
- Angiogenic glioma (grade I)
- Chordoid glioma of the third ventricle (grade II)
- Neuronal and mixed neuronal-glial tumors (grades I to III)
- Pineal tumors (grades I and IV)
- Embryonal tumors (grade IV)

- **Tumors of cranial and paraspinal nerves**
- Schwannoma (grade I)
- Neurofibroma (grade I)
- Perineurioma (grades I to III)
- Malignant peripheral nerve sheath tumor (grades II to IV)

- **Tumors of the meninges**
- Meningioma (grade I)
- Atypical meningioma (grade II)
- Anaplastic meningioma (grade III)
- Lymphomas and hematopoietic neoplasms:
- Malignant lymphoma (low and high grade)
- Plasmacytoma
- Granulocytic sarcoma

- **Other**
- Germ cell tumors
- Tumors of the sellar region (grade I)[3]

Tumors

Gliomas

Gliomas, the most common group of primary brain tumors, include astrocytomas, oligodendrogliomas, and ependymomas. These tumor types have characteristic histologic features that form the basis of the classification. It is no longer thought that these tumors derive from their specific, mature cell types (astrocytes, oligodendrocytes, and ependymal), but rather than they arise from a progenitor cell that preferentially differentiates down one of any the cellular lineages. Many of the tumors typically occur in certain anatomic regions within the brain, with characteristic age distribution and clinical course.

Neuronal Tumors Far less common than glial tumors are those that exhibit a neuronal differentiation. In general, neuronal tumors are most often seen in younger adults and often present with seizures and other sign and symptoms.

Poorly Differentiated Neoplasms

Some tumors, though of neuroectodermal origin, express few of any markers of mature neural cells and are described as pohave cellular features of primitive, undifferentiated cells. The most common one is the medulloblastoma, which accounts for 20% of brain tumors in children.

Other Parenchymal tumor

- Primary CNS Lymphoma
- Germ Cell Tumo and Pineal Parenchymal Tumors.[1]

Aim of study

To assess the frequency of different types of primary CNS tumors in Bagdad medical city then assess the relation with age, gender and clinical symptoms.

Subject and method

A retrospective analysis of 60 randomly selected patients with primary brain tumor collected from Teaching Laboratories of Baghdad Medical City from January 2019 to January 2020.

The data collection will include

Demographic analysis (age, residency and gender).

Clinical presentation (include persistent headache, seizures, nausea, vomiting, neurocognitive symptoms, and personality changes….ect).

Post-operative histopathological diagnosis.

Data will be collected from patient archived pathological report.

Then statistical analysis will be done to assess frequency of types of different types of primary brain tumors and their clinicopathologicl parameters.

RESULT

During this study the total number of collected cases 60 there were confirmed diagnosed as primary CNS tumor by pathological study which was found that Astrocytoma and Meningioma was the highest rate in same percentage as showen in table (1).fig.(1)

Table-1: The frequency of different types of primary CNS tumor.

CNS primary tumor	Number of cases	Percentage %
Astrocytoma	20	33.66%
Meningioma	20	33.66%
Ependymoma	6	10%
Oligodendroglioma	2	3.33%
Medulloblastoma	5	8.33%
Pituitary adenoma	1	1.66%
Hemangioblastoma	1	1.66%
Hodgkin lymphoma	1	1.66%
Collagenous fibroma	1	1.66%
Central neurocytoma	1	1.66%
Schwanoma	1	1.66%
Pineal paranchymal tumor	1	1.66%
Total	60	99.94

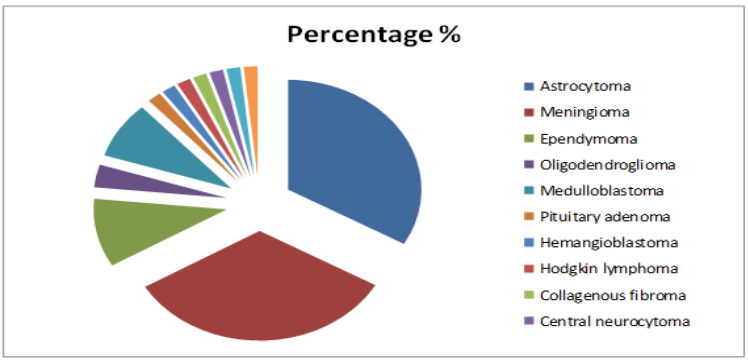

Fig. 1: Diagram illustrate frequency of different types of primary CNS tumor.

About clinical presentation headache was the most common clinical presentation followed by fit as showen in table (2) fig.(2).

Table-2: Distribution of clinical presentation associated with CNS tumor.

Clinical presentation	Number of cases	Percentage %
Headache	18	30%
Fit	16	26.66%
Weakness	14	23.33%
Vomtting	7	11.66%
Visual problem	3	5%
Altered consciousness	2	3.33%
Total	60	99.99

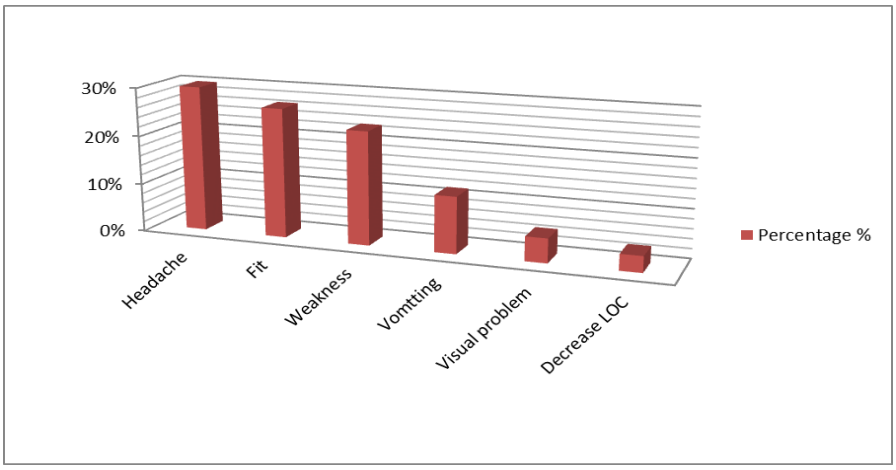

Fig. 2: Diagram illustrate Distribution of clinical presentation associated with CNS tumor.

Male is the more likely affected by the tumor as seen in table (3).fig.(3).

Table-3: Gender distribution in CNS tumor.

Gender	Number of cases	Percentage %
Male	32	53.33
Female	28	46.66
Total	60	99.99

Male to female ration of 1/1.14.

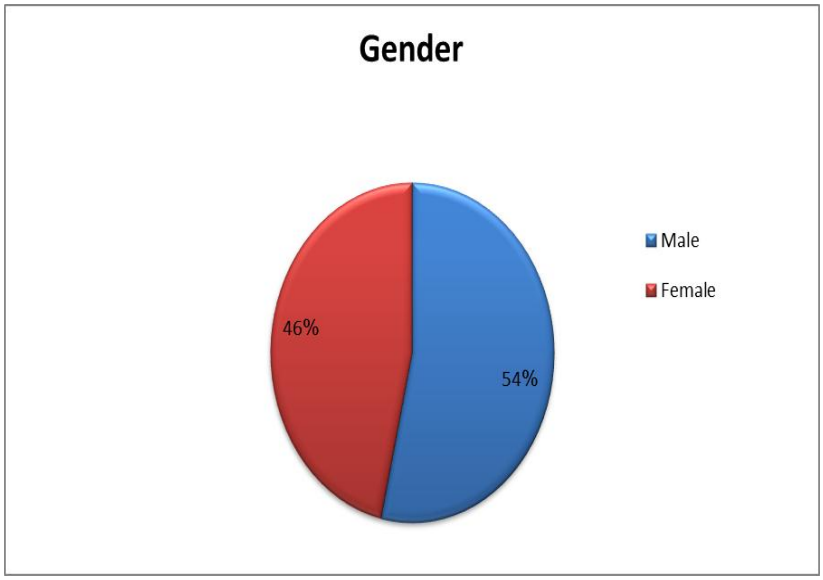

Fig. 3: Diagram Illustrate Gender distribution.

The age of patients range from 0-74 years, the highest percentage of primary CNS tumor 48.33% was found in patients between 15 -49 years of age as shown in table (4).fig.(4)

Table 4: Age distribution in CNS tumor.

Age in year	Number of cases	Percentage %
0-14	18	30%
15-49	29	48.33%
≥50	13	21.66%
Total	60	99.99%

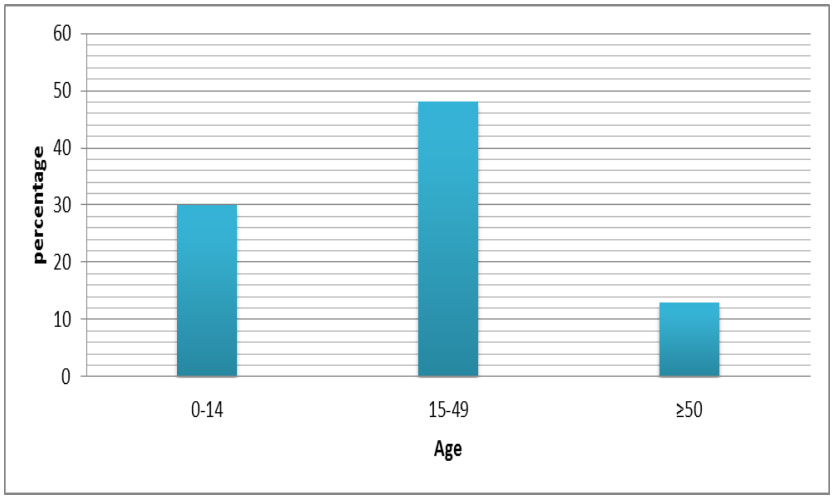

Fig. 4 Age distribution Histological pictures showing examples of primary CNS tumors.

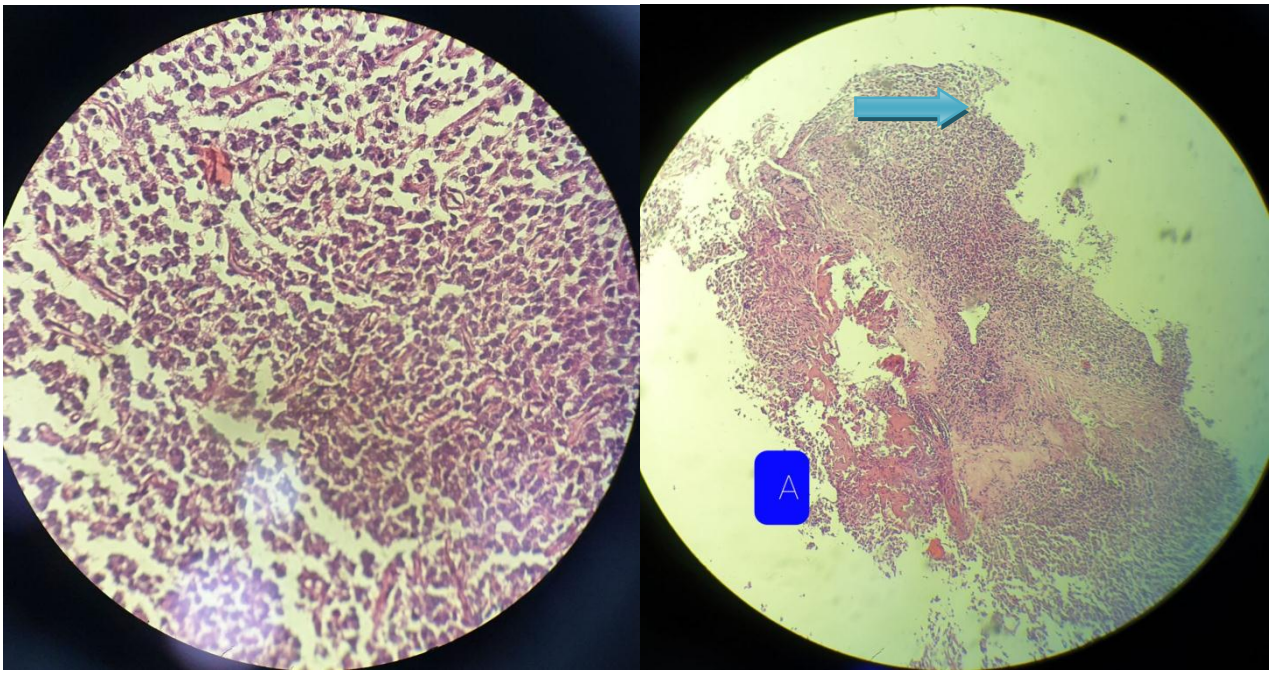

Fig. 5: Photograph of central neurocytoma showing monotonous bland cells with cytoplasmic "halo"(arrow) embedded in eosinophilic fibrillar matrix, (H and E stain) (A) 100X ,(B) 400X.

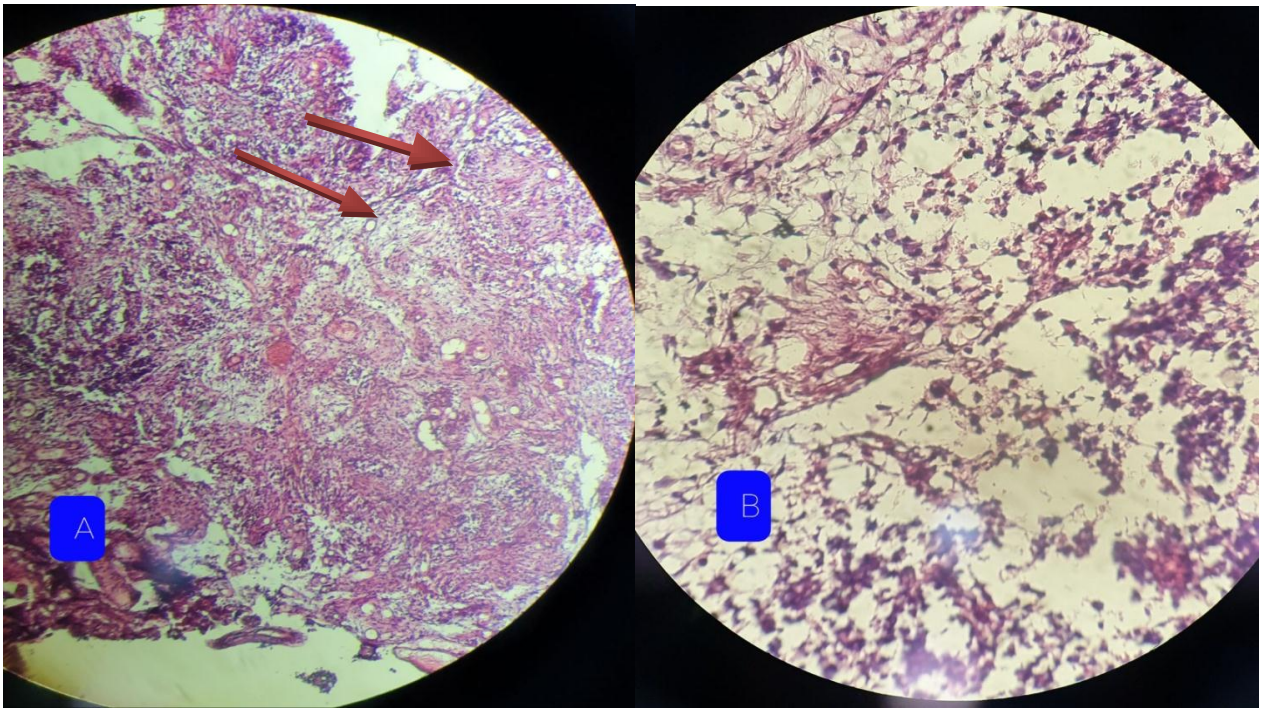

Fig.6 photograph of medulloblastoma nodular desmoplastic type showing (A) ill formed pale nodular islands surrounded by densely packed darker internodular tissue(arrows) (H&E stain 100X). (B) pale islands formed of uniform cells with a neurcytic appearance, the internodular tissue is formed of less differentiated hyperchromatic cells (H&E stain 400X).

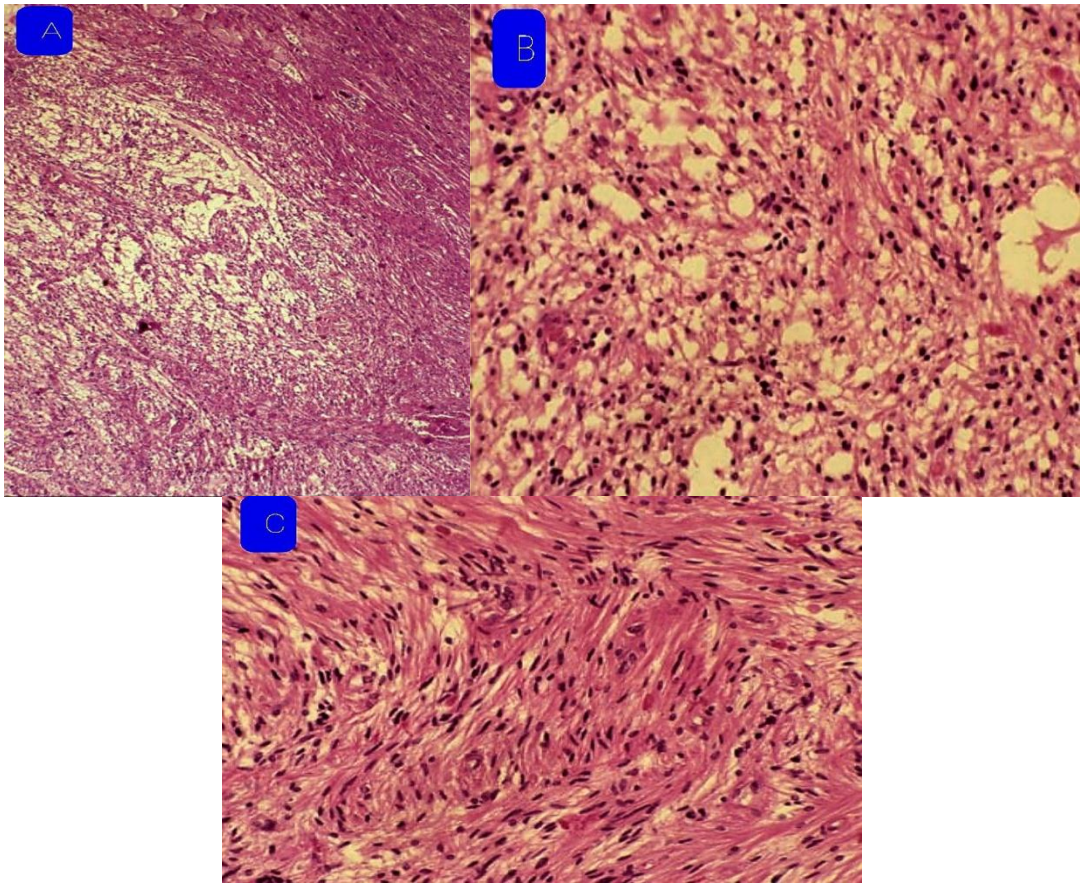

Fig. 7: Photograph of pilocytic astrocytoma (hematoxylin and eosin (H&E) stain). (A) Biphasic histologic pattern of a loose microcystic component and a dense with higher-power views of the (B) loose and (C) dense areas.

DISCUSSION

Primary brain tumors include tumors that originate from the tissues of the brain or the brain's immediate surroundings. Primary tumors are categorized as glial (composed of glial cells) or non-glial (developed on or in the structures of the brain, including nerves, blood vessels and glands) and benign or malignant.[12,14]

Majority of primary CNS tumor in this work were of astrocytoma (glioma) 20 cases from 60 cases and meningioma 20 cases from 60 cases both comprising 66.66% this is going in agreement with a study done in KSA,[7] and Japan,[8] but in this work is same percentage of glioma and meningioma that was because of smaller sample than these studies.

In this study all patients with primary CNS tumor are presented with headache 30% of varying severity this is due to increased intracranial pressure by space occupying lesion that affects (pressure) the neural tissue. this result were concordance with many studies done in Michigan,[5] and New York.[13,6]

For gender in this study had been found that male gender is more liable to be affected than female by primary CNS tumor in 53.33% which going with many studies done in Michigan,[5] and KSA.[7]

Also in this study had been found that the main age group is between (15-50) 48.33% followed by second group age (0-14)years 30% and this corresponding with regional study,[7] but incorrespnding with international studies done in Michigan,[5] and UK,[6] because our country considered a high reproductive country,[10] and low average age.[9]

CONCLUSION

In this study meningioma and glioma (astrocytoma) are the most common type of primary CNS tumor. Headache is the most clinical presentation, male predominance. the highest primary CNS tumor (48.33%) was found in patients between 15-49 years old. because our country considered a high reproductive country and low average age in general.

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