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Corresponding Author
Apoorva Mathur,
Department of Pathology, Rohilkhand Medical College and hospital, Bareilly, Uttar Pradesh, India

Author Designation
[1]Postgraduate Student
[2,3]Professor

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Clinicomorphological Spectrum of Meningioma at A Tertiary Care Center

[1]Apoorva Mathur, [2]Sagar Mhetre and [3]Nitesh Mohan
[1-3]Department of Pathology, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India

ABSTRACT
Meningiomas are benign neoplasms of the meninges, accounting for a significant portion of intracranial tumors. Their clinical presentation and histological features can vary widely, making accurate diagnosis and management crucial. This study aims to explore the clinico-morphological spectrum of meningiomas at a tertiary care center, providing valuable insights into their prevalence, demographics, clinical characteristics and histological subtypes. This was a retrospective study of 25 histologically diagnosed cases of meningioma during period of one year. Demographic, clinical and radiological data were collected from medical records. The detail histopathological examination were studied by review of hematoxylin and eosin (H and E) stained slides. Morphological classification and grading of meningiomas were done as per WHO criteria. In this study, the most common age group was 41-50 years (32%) with female predominance of 68%. The most common symptom was headache seen in 96% patients followed by vomiting in 80% patients. Most of the tumor were intracranial with frontal lobe was the commonest site. Meningothelial meningioma was the most common histological variant. 92% of meningiomas were histologically categorised as Grade-I. Our findings highlight the diverse nature of these tumors, with variations in patient demographics, clinical presentations, and histological subtypes. Histologically, meningiomas were predominantly benign, but a subset exhibited atypical or malignant features, emphasizing the importance of accurate classification and grading for prognostic purposes.

INTRODUCTION

In 1922, Harvey Cushing termed tumor originating from the meninges as meningioma[1]. Meningiomas are slow growing, dura based intracranial tumors arising from the meningothelial cells accounting for 15-30% of the primary brain neoplasms[2]. with an average annual age adjusted rate of 8.58 cases per 100,000 population[3]. It typically arise in intracranial, intraspinal, or orbital locations and very rarely from the intraventricular region[2-3].

The risk of meningioma increases with age with median age at diagnosis is 66 years. Across all ages, the incidence of meningioma is more common in middle age. Environmental factors such as exposure to ionizing radiation is the primary established risk factor for meningioma[3].

Evidence of an association between hormones and meningioma risk is also reported in multiple studies which suggests greater incidence of disease in women than men. Moreover, other factors such as female hormones, use of oral contraceptive pills, hormonal replacement therapy, certain cancers such as breast cancer, some genetic diseases may increase the risk of having meningioma but not necessarily cause it to occur[4].

Meningiomas display a wide diversity of histopathological appearances. The WHO classification of tumors of the central nervous system describes three grades of meningiomas which is reflected by the 15 subtypes. Most subtypes are benign and correspond to WHO grade 1[3]. Certain histological subtypes are associated with less favorable clinical outcomes and correspond to WHO Grades II (atypical) and III (anaplastic or malignant)[5].

The proper type, grading and histological features are very important for the management, treatment, prognosis and follow up of the patients. Histological grade of meningioma is important in deciding subsequent therapeutic intervention and management. Surgery is the treatment of choice for Grade I tumors whereas Grade II and grade III tumors require both surgery and radiotherapy. Histological grade and extent of surgical resection are very important parameters to predict recurrence of tumors. This study aims to explore the clinic-morphological spectrum of meningiomas at a tertiary care center, providing valuable insights into their prevalence, demographics, clinical characteristics and histological subtypes. A detailed analysis can help identify specific patterns and trends, aiding in accurate diagnosis and targeted treatment.

MATERIALS AND METHODS

A tertiary case hospital based retrospective study was conducted for a time span of 1 year in the Departments of Pathology at Rohilkhand Medical College and Hospital, Bareilly, UP. A total of 25 cases of meningioma of all age groups were included in this study. The data was extracted from the hospital medical records, including age, gender, medical history, anatomic location of tumor on imaging, histopathological features, histopathological subtype and grade of tumor according to the WHO grading system (2021). For histopathological examination, Hematoxylin and Eosin stain formalin fixed embedded tissue sections were examined.

Ethical clearance was obtained from Institutional Ethics Committee, RMCH. The collected data was entered in the Microsoft Office excel software. Data analysis was done using SPSS (Statistical Package for Social Science) 23.0 version.

Inclusion Criteria: The study includes patients of all age groups and both genders diagnosed as meningioma.

Exclusion Criteria: All other CNS tumors were excluded from the study.

RESULTS AND DISCUSSIONS

A total of 25 cases diagnosed as meningioma by histopathological examination were studied which accounts for 19.2% of all CNS neoplasms with an incidence rate of 5.769. Meningioma being a neoplasm of middle age female with a peak incidence observed in 41-60 years of age (mean age=44 years) . Marked female predominance (68%) was noted with female to male ratio of 2.1:1. (Fig. 1 and 2).

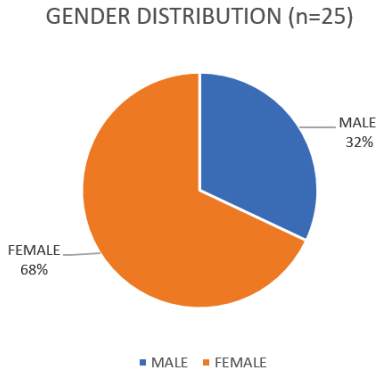

Fig. 1: Gender Distribution

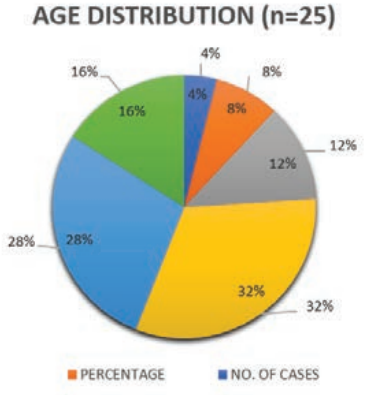

Fig. 2: Age Distribution

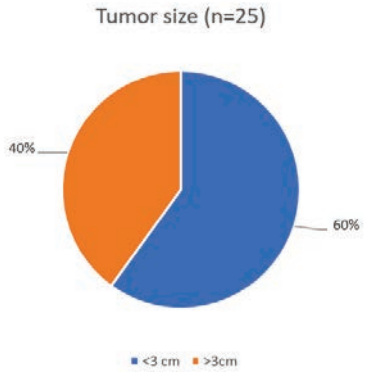

Fig. 3: Tumor Size

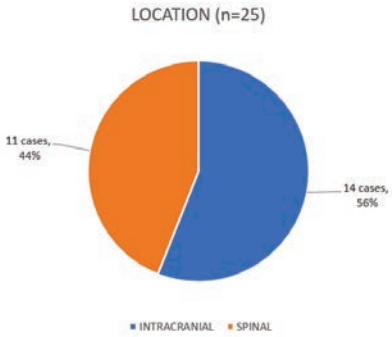

Fig.4: Location

Table 1: Intracranial Location

LOCATION	NO. OF CASES (n)	PERCENTAGE
Cerebral convexity	14	56%
Parasagittal	5	20%
Posterior fossa	3	12%
Tentorium	2	8%
Infraorbital	1	4%
TOTAL:	25	100%

Out of 25 cases of meningioma, The majority of tumors were smaller than 3 cm (60%). 56% were located intracranially. Of the intracranial meningiomas, cerebral convexity was the most common site. A significant number of cases involved the spinal cord (44%). (Fig. 3, 4,Table 1).

Table 2: Presenting complaints

Chief Complaints	NO. Of Cases (n)	Percentage
Headache	11	44%
Vomiting	5	20%
Seizures	4	16%
Decreases vision	1	4%
Decreases hearing	1	4%
Tingling and numbness of limbs	1	4%
Altered sensorium	2	8%
TOTAL:	25	100%

Commonest clinical presentation for meningiomas was headache (44%) followed by vomiting (20%) and seizures (16%). Other presenting complaints such as loss of consciousness (8%), decreased vision (4%), decreased hearing (4%) and numbness of the limbs (4%) were also frequently reported. (Table 2).

Table 3: WHO Grade of Meningioma

WHO GRADE	NO. OF CASES	PERCENTAGE
I	23	92%
II	2	8%
III	0	0
TOTAL:	25	100%

Table 4. Histomorphological Patterns of Meningioma

HISTOMORPHOLOGICAL PATTERNS	NO. OF CASES (n)	PERCENTAGE	
Menigothelial meningioma	13	52%	92%
Psammomatous meningioma	5	20%	
Transitional meningioma	3	12%	
Fibrous meningioma	2	8%	
Atypical meningioma	2	8%	8%
TOTAL:	25	100%	

The histological gading of meningioms was done according to WHO grading system (2021). The frequency of grade 1,2 meningiomas was 92% and 8% respectively. Grade 3 meningioma cases were not observerd.(Table3) Among WHO grade 1 meningiomas, the most common histologic subtype was meningothelial meningioma (52%) followed by psammomatous meningioma (20%) while only 2 cases (8%) of atypical meningioma which is a histologic subtype of WHO grade 2 meningiomas were observed. (Table 4).

Table 5. Histological Features Observed in Different Variants of Meningioma

	Meningiothelial (n=13)	Psammomatous (n=5)	Transitional (n=3)	Fibrous (n=2)	Atypical (n=2)
Hypercellularity	13	5	3	2	2
Pseudoinclusion	10	4	2	1	1
Macronucleoli	11	1	1	0	0
Psammoma bodies	1	5	1	0	0
Necrosis	0	0	0	0	1
Whorls	11	2	3	1	2
Brain invasion	0	0	0	0	0
Mitotic figures <4	13	5	3	2	0
(/10 hpf)4-19	0	0	0	0	2
>20	0	0	0	0	0

Several histopathological features were studied. Meningothelial meningioma was characterized by hypercellularity, pseudoinclusions and macronucleoli while presence of numerous psammsoma bodies was observes in Psammomatous meningioma. Transitional meningioma showed intermediate features between meningothelial and fibrous subtypes. Predominance of fibrous tissue was observed in Fibrous meningioma. Atypical meningioma showed higher cellularity, increased mitotic activits and necrosis. (Table 4).

Figure 5. WHO Grade 1 Meningiomas:

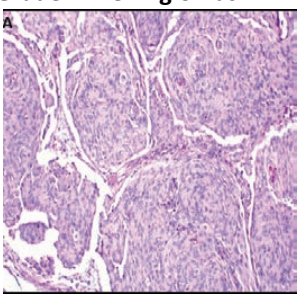

Fig 5: A. Meningothelial meningioma : lobular growth pattern, syncytial-like appearance and occasional intranuclear pseudoinclusion

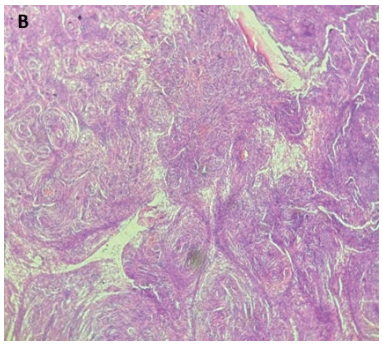

Fig 5B: Fibrous meningioma: fascicular spindle cell tumor and variable collagen deposition

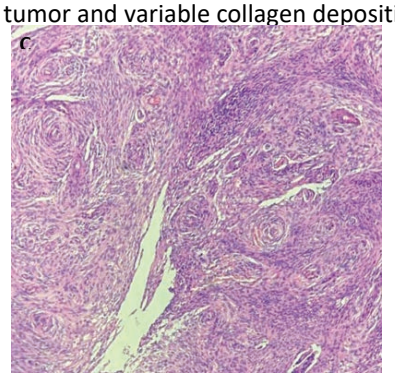

Fig 5C: Transitional meningioma: prominent whorls along with fibrous tissue

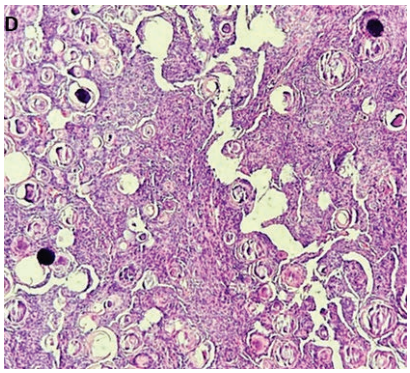

Fig 5D: Psammomatous meningioma: complete replacement of meningioma with psammomatous calcification

Figure 6: WHO Grade 2 meningioma

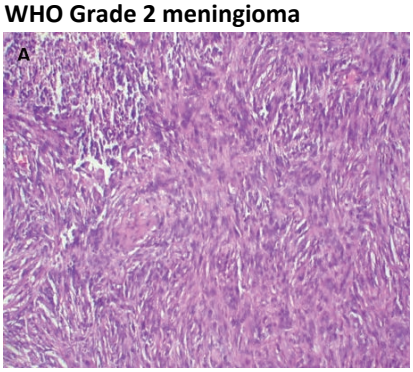

Fig. 6A: Atypical meningioma: hypercellular with sheeting architecture

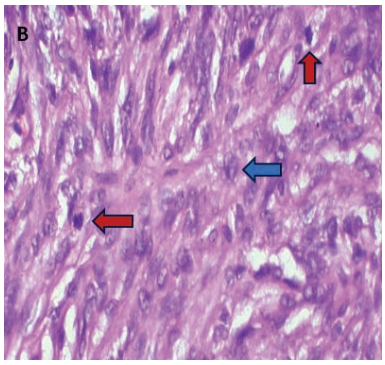

Fig 6B: Atypical meningioma: Small cells with high N:C ratio, macronuclei (blue arrow), increased mitotic count (red arrow) and necrosis

Meningiomas account for 37.6% of all CNS tumours and are the most common tumours arising from the meninges[3]. This study presents a review of 25 operated primary meningeal lesions classified according to the latest WHO grading system (2021), with the aim to study the clinico-morphological spectrum of meningiomas.

In the present study, the average age of patient was 44 years, indicating prevalence in middlr age individuals. The majority of patients were females (685%) with female to male ratio of 2.1:1, which was comparable with the study conducted by Mukhopadhyay[5], Niranjan[6], Shrilakshmi[7].

Most tumors were located in the intracranial location (56%), with the cerebral convexity being the most common site (35.7%). A significant number of cases involved the spinal cord (44%). The above results were similar to studies done by Shrilakshmi[7] Mubeen[8].

The most frequently presenting symptom headache (44%) followed by vomiting (20%) and seizures (16%), related to raised intracranial pressure which was concordance with Shah[9] and Maruf raza[10]. In 60% cases tumors were smaller than 3 cm which was found concordant with study conducted by Oktora[11].

Frequencies of histopathological subtype of meningioma studied showed commonest type being meningothelial meningioma (52%), followed by psammomatous meningioma (20%) which corresponded with the study of Maruf raza[10] Niranjan[6] and Khade[12].

Meningiomas are graded into WHO Grade 1, Grade 2 and Grade 3. Grade 1 meningiomas are benign and rarely recur while grade II and Grade III meningiomas tend to recur more frequently. In all the reference studies by Kumar[13](96.07%), Afrin[12](76.7%), Oktora[11] (88.9%), Grade 1 meningioma was the most common type. Higher incidence of Grade 2 tumors was noted in the studies done by S Babu[14] (26%) and Thomas BG et [15] (30.1%). Grade 3 tumors were less common in all the studies and no case of grade III tumor of all meningiomas were observed in the present study. The high grade meningiomas are very aggressive (Grade 2

and Grade3) and are associated with increased mortality and morbidity[2]. On the contrary, atypical meningioma (WHO Grade-II) has significant increased risk of mortality. They carry approximately 8-fold increased risk or recurrence over benign tumours (WHO Grade-I)[2].

CONCLUSION

This study has provided a comprehensive analysis of the clinic-morphological spectrum of meningiomas at a tertiary care center. Our findings highlight the diverse nature of these tumors, with variations in patient demographics, clinical presentations and histological subtypes. We observed a predominance of female patients, with a wide age range reflecting the potential for meningioma development at different stages of life. The most common clinical manifestations included headaches, seizures and neurological deficits. Histologically, meningiomas were predominantly benign, but a subset exhibited atypical or malignant features, emphasizing the importance of accurate classification for prognostic purposes.

This study underscores the need for a tailored approach to the management of meningiomas, considering the patient's age, symptoms and histological subtype. Further research is warranted to explore the underlying molecular mechanisms driving meningioma development and progression, with the aim of identifying novel therapeutic targets for improved patient outcomes.

Conflict of Interest: None

REFERENCES

1. CUSHING, H., 1922. The meningiomas (dural endotheliomas): Their source, and favoured seats of origin. Brain, 45: 282-316.
2. Kumar, J., P.V. Kamatar and V. Athanikar, 2023. Study of Clinico-Pathological Spectrum of Meningioma with WHO Grading. Headache, 39: 47-76.
3. Sahm, F., P.K. Brastianos and E.B. Claus,et al., 2021. WHO Classification of Tumours Editorial Board. World Health Organization Classification of Tumours of the Central Nervous System. 5th ed.Lyon: Intern Age Rese Can., Vol. 23 .10.1093/neuonc/noab106.
4. Miyagishima, D.F., J. Moliterno, E. Claus and M. Günel, 2023. Hormone therapies in meningioma-where are we? J. Neuro-Oncol., 161: 297-308.
5. Mukhopadhyay, M., C. Das, M. Kumari, A. Sen, B. Mukhopadhyay and B. Mukhopadhyay, 2017. Spectrum of meningioma with special reference to prognostic utility of er, pr and ki67 expression. J. Lab. Physicians, 9: 308-313.
6. Niranjan, J., V.V. Priya and A.S. Shivarudrappa, 2019. Histopathological spectrum of meningiomas: A retrospective study. Indian J. Pathol. Oncol., 6: 256-260.
7. Shrilakshmi, S., 2015. Meningiomas: a clinicopathological study. Int J Med Res Health Sci., 4: 827-831.
8. Mubeen, B., R. Makhdoomi, K. Nayil, D. Rafiq and A. Kirmani et al., 2019. Clinicopathological characteristics of meningiomas: Experience from a tertiary care hospital in the kashmir valley. Asian J. Neurosurg., 14: 41-46.
9. Shah, A.B., G.A. Muzumdar and A.R. Chitale, 2005. Meningiomas: A Report of a hospital-based registry. Indian J Path Microb., 48: 468-471.
10. Raza, A.K., F. Ahmed, A.R.I. Zaman and T. Khatun, 2017. Histomorphological spectrum of meningioma with variants and grading. Headache, 55: 53-53.
11. Oktora, M.Z., D. Anggraini and A.F. Sirfa, 2024. Relationship between age and histopathological type of meningioma according to the world health organization (WHO). Nusantara Hasana Journal., 3: 71-78.
12. Khade, S., R. Waghmare and A. Shenoy, 2019. Histopathological study of meningioma in a tertiary care centre: a two years experience. Tropical J of Patho Micro., 5: 1-7.
13. Afrin, S.S., N. Shaheen, N. Awal, M.S. Hossain and J.S. Rashid,et al., 2023. The Clinical Status of Meningothelial Meningioma Patients. Saudi J Med Pharm Sci., 9: 448-452.
14. Babu, S., S.G. Uppin, M.S. Uppin, M.K. Panigrahi and V. Saradhi,et al., 2011. Meningiomas: Correlation of ki67 with histological grade. Neurol. India, 59: 204-207.
15. Thomas, B.G., B.H. Moen and S.H. Torp, 2012. The histopathological spectrum of human meningiomas. Int J Clin Exp Pathol., 5: 231-242.