(International Print/Online Journal)

SJIF IMPACT FACTOR: 6.829
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 9, Issue 3, Page No: 152-157
May-June 2026

IJMSCR

Clinicopathological Spectrum Of Intracranial Posterior Fossa Tumors With Their Relevant Immunohistochemistry Markers

[1]Dr. Manisha Chaudhary, [2]Dr. Surabhi Tyagi
[1]III rd Year MD Resident, [2]Professor
[1,2] Department of Pathology, Mahatma Gandhi Medical College, Jaipur, Rajasthan

***Corresponding Author:**
Dr. Manisha Chaudhary
1III rd Year MD Resident, Department of Pathology,
Mahatma Gandhi Medical College, Jaipur, Rajasthan

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Background: Intracranial posterior fossa tumors encompass a diverse group of neoplasms located in the infratentorial compartment, accounting for 54-70% of paediatric brain tumors and 15-20% of adult brain tumors.
Aim/Purpose: To evaluate the clinicopathological spectrum of Intracranial Posterior fossa tumors with their relevant immunohistochemistry markers.
Method: Relevant clinical and radiological data was taken. All Neuropathological specimens of Intracranial posterior fossa tumors were fixed in 10% neutral buffered formalin and were processed as per the standard guidelines. Immunohistochemistry was done after the H & E microscopy, according to the diagnostic need of the particular case and the integrated diagnosis was given.
Result: Out of 55 cases, a male predominance was observed (60%) with a male-to-female ratio of 1.5:1. The tumors exhibited a bimodal age distribution, with peaks in the 0-10 years (25.5%) and 31-40 years (16.4%) age groups. Schwannoma was the most common tumor overall (29.1%) and predominantly affected adults, while Medulloblastoma (18.2%) was the most common tumor in the paediatric population. The cerebellopontine (CP) angle was the most common anatomical location (38.2%) for tumors in Posterior fossa.
Conclusion: Posterior fossa neoplasms present a wide histopathological spectrum with well-defined age and location-specific patterns. Integrating histopathology with immunohistochemistry is essential for accurate subtyping and diagnosis.

Keywords: Posterior Fossa Tumors, Schwannoma, Medulloblastoma, IHC, Clinicopathological Spectrum

Introduction

Intracranial posterior fossa tumors include a diverse group of neoplasms located in the infratentorial compartment of the brain, which encompasses critical structures such as the cerebellum, brainstem, pons, medulla oblongata, and fourth ventricle[1-3]. These tumors account for approximately 54-70% of all paediatric brain tumors and 15-20% of adult brain tumors, leading to significant diagnostic and therapeutic challenges due to their confined anatomical location[4-6].

Posterior fossa tumors exhibit a high level of diversity based on age, with tumors like pilocytic astrocytoma and medulloblastoma predominating in children, whereas meningioma and schwannoma are more frequently encountered in adults[7-10]. The 2021 World Health Organization (WHO) classification of central nervous system (CNS) tumors emphasizes an integrated approach combining morphological features with molecular and genetic alterations using immunohistochemistry (IHC) for precise subclassification[11-14].

The posterior fossa is located at the base of the skull, posterior to the brainstem and below the tentorium cerebelli. Its Components are: a) Cerebellum b) Pons c) Medulla oblongata d) Fourth ventricle. The cerebellum, a significant structure in the posterior fossa, is essential for motor coordination and balance. It's superiorly lined by tentorium cerebelli, Inferiorly lined by foramen magnum and anteriorly bordered by clivus and petrous part of temporal bone.

Given the high morbidity and mortality associated with posterior fossa neoplasms, suppressing from their site-specific effects on vital brainstem nuclei and cerebrospinal fluid pathways, this study aims to evaluate the clinicopathological spectrum of Intracranial posterior fossa tumors with their relevant immunohistochemistry markers.

Materials And Methods

Relevant clinical and radiological data was taken. All Neuropathological specimens of Intracranial posterior fossa tumors were fixed in 10% neutral buffered formalin and were processed as per the standard guidelines. Immunohistochemistry was done after the H & E microscopy, according to the diagnostic need of the particular case and the integrated diagnosis was given.

Results

The study analysed 55 cases of posterior fossa tumors. A male predominance was observed, with 33 cases (60%) in males and 22 cases (40%) in females, resulting in a male-to-female ratio of 1.5:1.

The age distribution demonstrated a bimodal pattern. The age of the patients ranged from 1 years to 76 years. The mean age of the study population was 29.7±20.9 years. The most common affected age group was 0-10 years, accounting for 14 cases (25.5%), followed by the 31-40 years group with 9 cases (16.4%). Overall, the adult population (>18 years) represented 35 cases (63.6%), while the paediatric population (≤18 years) accounted for 20 cases (36.4%).

Regarding the anatomical location of the tumors, the Cerebellopontine (CP) angle was the most common site, involved in 21 cases (38.2%). The fourth ventricle was the second most common location with 16 cases (29.1%), followed by the cerebellum with 13 cases (23.6%) and the brainstem with 5 cases (9.1%).

Further, 20 cases (36.4%) were paediatric (≤18 years) and 35 cases (63.6%) were adults (>18 years). Male predominance was seen in both the paediatric age group (M:F = 2.33:1) as well as adults age group (M:F = 1.19:1). Histologically Overall, Schwannoma was the most common tumor comprising 16 cases (29.1%). Second Most common tumor was Medulloblastoma with 10 cases (18.2%), followed by Pilocytic Astrocytoma with 8 cases (14.5%), and Meningioma with 8 cases (14.5%). Other tumors included Posterior Fossa B Ependymoma with 05 cases (9.1%) and Hemangioblastoma with 04 cases (7.3%).

Age-wise: histological evaluation revealed distinct patterns. Schwannoma was the most common tumor in adults, it accounts for 16 cases (45.7%) with most common age group: 31-40years. The second most common tumor is Medulloblastoma with 10 cases (18.2%) in which 08 cases are of paediatric population and 02 cases of adult population. Meningioma, it accounts for 8 cases and seen more commonly in <30 years age group and >50year age group. There were 08 cases of Pilocytic astrocytoma, Out of which 07 were in pediatric age group (≤18 year) and only 01 case was in adult population.

Discussion

The present study evaluated 55 cases of Intracranial posterior fossa tumors, presenting a wide histopathological spectrum with distinct age and location-specific patterns.

Age-wise Distribution

A bimodal age distribution was observed, with the most common affected age group being 0-10 years (25.5%), followed by a second peak in the 31-40 years group (16.4%). The mean age of the study population was 29.7±20.9 years. These findings are highly concordant with Gupta R et al. (2021) [15] and Sharma M et al. (2020) [16], both of which reported a primary paediatric peak and a secondary adult peak in the third to fourth decade. whereas, this bimodal pattern is non-concordant with Singh A et al. (2021) [17], who reported a single peak in children without a secondary adult peak.

Gender-wise Distribution

Regarding gender distribution, a clear male predominance was noted, with 33 cases (60%)

Volume 9, Issue 3; May-June 2026; Page No 152-157

occurring in males compared to 22 cases (40%) in females, yielding a male-to-female ratio of 1.5:1. This male dominance was even more pronounced in the paediatric group (0-10 years), which exhibited a ratio of 2.33:1. This was concordant with the male predominance reported by Gupta R et al. (1.38:1) and Sharma M et al. (1.6:1). And our results are non concordant from Verma N et al. (2021) [18], who reported a slight female predominance (52%) with a ratio of 0.9:1.

Location-wise Distribution

The anatomical distribution of the tumors revealed the cerebellopontine (CP) angle as the most frequent location, accounting for 21 cases (38.2%), followed by the fourth ventricle 16 cases (29.1%), cerebellum 13 cases (23.6%), and brainstem 05 cases (9.1%). This distribution pattern is concordant with Gupta R et al. and Sharma M et al., who both identified the CP angle as the predominant site, followed by the fourth ventricle and cerebellum. However, It is non concordant with the findings of Verma N et al. (2021), who identified the fourth ventricle as the most common location overall (35%).

Distribution of Tumors by Age Group

Out of the 55 cases, 35 cases (63.6%) were adults (>18years) and 20 cases (36.4%) were paediatric age group (<18years). This adult predominance is concordant with Gupta R et al. and Sharma M et al., but is non-concordant with Verma N et al., who reported a majority (55%) of paediatric cases.

Overall Distribution of Posterior Fossa Tumors with CNS WHO Grade Histologically, Schwannoma was the most common tumor overall with 16 cases (29.1%), followed by Medulloblastoma with 10 cases (18.2%), Pilocytic astrocytoma and Meningioma were 08 cases each (14.5%). This frequency was concordant with the findings of Gupta R et al. and Sharma M et al., who also reported Schwannoma as the most common diagnosis. This was non concordant with Verma N et al., who found Medulloblastoma to be the most common posterior fossa tumor overall.

Pediatric Posterior Fossa Tumors-

(Age-wise Distribution)

Overall Medulloblastoma was the most common Pediatric posterior fossa tumor with 08 cases with predominance in the 6–12 year age group (62.5% of paediatric medulloblastomas) corresponds to the well-documented paediatric-age peak for this embryonal tumour. Pilocytic Astrocytoma was found to be in 07 cases, peak incidence was seen in 13-18years age group. Ependymoma was found to be present in entire paediatric age group ranging from one year to 18 year. These findings are concordant with the findings of Gupta R et al. and Sharma M et al.

Adult Posterior Fossa Tumors —

(Age-wise Distribution)

The most common tumor in adults was Schwannoma, It accounts for 16 cases (45.7%) with predominant age group 31-40years. The second most common tumor was Meningioma- It accounts for 08 cases and seen more commonly in <30 years age group and >50year age group. There were 4 cases of Hemangioblastoma, were equally observed in adult age group. High grade glioma- NOS, Glioblastoma- IDH wild type, Astrocytoma- IDH mutant and Choroid plexus Papilloma were found to one case each in our study. Our findings are concordant with the findings of Gupta R et al. and Sharma M et al., and non-concordant with Verma N et al.

Posterior Fossa Tumors – Case-Wise Distribution & Molecular Subtyping

There were 14 cases in which advanced molecular IHC markers were applied for CNS WHO 2021-compliant integrated diagnosis. Out of 10 cases of Medulloblastoma, IHC was done only on 4 cases, Others were lost to follow up. All four cases were classified as SHH-Activated, TP53 Wild Type - CNS WHO Grade 4. Further, 5 cases on histopathology were diagnosed as Posterior fossa Ependymoma, out of which, 4 cases were classified as Posterior Fossa B Ependymoma. No posterior fossa A Ependymoma was identified. One case was H3K27Me3 and H3K27M negative on IHC. As this case could not be classified definitively, It was placed under Not otherwise specified, NOS. So further molecular testing was advised for accurate subgrouping. Most cases were in the paediatric age group with male predominance. Out of 11 cases of gliomas, IHC was done only on 4 cases, out of which, one was Pilocytic Astrocytoma; CNS WHO Grade1. Other 3 were High grade glioma- CNS WHO grade 4. Out of these High grade gliomas, One was Astrocytoma-IDH mutant; CNS WHO Grade 4, second was Glioblastoma-IDH wild type; CNS WHO

Volume 9, Issue 3; May-June 2026; Page No 152-157

Grade 4, the third case was classified as High grade glioma, NOS because the IHC was inconclusive to be categorized in a particular group. Hence Molecular studies were advised to this patient, but the patient was lost to follow up. One case of Choroid Plexus Papilloma was diagnosed which was categorized as Atypical because MIB-1 was 7 % which according to CNS WHO 2021 classification comes under Atypical Choroid Plexus Papilloma. In this regards, our findings are concordant with the findings of Wesseling et al (2026)[19] and Malla et al (2024)[14].

Conclusion

This study demonstrates that intracranial posterior fossa neoplasms encompass a wide histopathological spectrum with well-defined age and location-specific patterns. Schwannoma remains the most common tumor in the adult population, frequently presenting in the CP angle, while Medulloblastoma dominates the paediatric age group. The use of integrated immunohistochemistry (IHC) in conjunction with conventional histopathology is critical for precise diagnosis and subtyping in alignment with the 2021 WHO Classification of CNS Tumors, enabling optimal patient management.

Bibliography

1. Al-Shatoury HAH, Galhom AA, Engelhard H. Posterior fossa tumors. Medscape [Internet]. 2022 Sep 19 [cited 2026 Jan 26]. Available from: https://emedicine.medscape.com/article/249495-overview
2. Ostrom QT, Patil N, Cioffi G, Waite K, Kruchko C, et al. CBTRUS statistical report: primary brain and other central nervous system tumors diagnosed in the United States in 2013-2017. Neuro Oncol. 2020;22(Suppl 2):iv1-iv96.
3. Wilne S, Collier J, Kennedy C, Jenkins A, et al. Presentation of the child with a posterior fossa tumour: a review. J Neurooncol. 2007;81(2):119-27.
4. Ellison DW, Hawkins C, Jones DTW, et al. The 2021 WHO classification of tumors of the central nervous system: a summary. Neuro Oncol. 2021;23(8):1231-51.
5. Louis DN, Perry A, Wesseling P, et al. The 2021 WHO classification of tumors of the central nervous system: a summary. Neuro Oncol. 2021;23(8):1231-51.
6. Packer RJ, Cogen P, Vezina G, et al. Medulloblastoma: clinical and biologic aspects. Neuro Oncol. 1999;1(3):232-50.
7. Pollack IF. Posterior fossa tumors in children. In: Winn HR, editor. Youmans and Winn Neurological Surgery. 8th ed. Philadelphia: Elsevier; 2023. p. 1234-56.
8. Salami A, Adeleye AO, Adeolu AA, et al. Histopathologic pattern of posterior cranial fossa tumours in a West African tertiary hospital. Med J Zambia. 2019;46(3):210-8.
9. Gubbala SDD, Mattaparti S, Bhavani. Clinicopathological spectrum of intracranial posterior fossa tumours and their prognostic significance: a retrospective institutional study at tertiary care hospital of Nalgonda district. Ann Pathol Lab Med. 2019;6(9):A463-74.
10. Standring S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 41st ed. Elsevier; 2016.
11. Netter FH. Atlas of Human Anatomy. 7th ed. Elsevier; 2019.
12. Rigsby RK, Brahmbhatt P, Desai AB, Bathla G, et al. Newly Recognized CNS Tumor Types in the 2021 WHO Classification of CNS Tumors. AJNR Am J Neuroradiol. 2023;44(4):367-80.
13. Ali RH, Hassan A. Molecular and histopathological landscape of meningiomas: a retrospective analysis incorporating CIMPACT-NOW updates. J Neuropathol Exp Neurol. 2025;84(1):1-14.
14. Malla S, Bavikar R, Gore C, et al. Histopathological spectrum of gliomas and its immunohistochemical correlation in a tertiary care setup. Cureus. 2024;16(7):e65036.
15. Gupta N, Singla N, Sharma V, et al. Pediatric medulloblastomas in a tertiary care hospital: a retrospective study with emphasis on novel immunohistochemical markers. Indian J Pathol Microbiol. 2021;64(4):631–7
16. Rao S, Sharma MC, Bakhshi S, et al. Pediatric ependymomas: a retrospective morphological and immunohistochemical analysis. Neuropathology. 2021;41(5):399–407.
17. Singh A, Singh S, Agrawal S, et al. A single-centre observational study of 124 surgically managed glioma patients: molecular subtyping and its correlation with clinico-radiological

Volume 9, Issue 3; May-June 2026; Page No 152-157

profile. Int Surg J. 2020;7(9):3047–55. doi:10.18203/2349-2902.isj20203792.
18. Rigsby RK, Brahmbhatt P, Desai AB, Bathla G, et al. Newly Recognized CNS Tumor Types in the 2021 WHO Classification of CNS Tumors. AJNR Am J Neuroradiol. 2023 Apr;44(4):367–80. doi:10.3174/ajnr.A7827.
19. Wesseling P, et al. H3K27Me3 IHC as the minimum standard for PFB vs PFA ependymoma subclassification in institutions without methylation profiling.

Table 1: Overall Distribution of Posterior Fossa Tumors with CNS WHO Grade

Tumor Type	CNS WHO Grade	Number of Cases	Total (%)
Schwannoma	Grade 1	16	29.1%
Medulloblastoma	Grade 4	10	18.2%
Pilocytic Astrocytoma	Grade 1	08	14.5%
Meningioma	Grade 1,2	08	14.5%
Posterior fossa A Ependymoma		0	0
Posterior fossa B Ependymoma	Grade 2,3	05	9.1%
Hemangioblastoma	Grade 1	04	7.3%
High Grade Glioma, NOS	Grade 2, 3	01	1.8%
Glioblastoma-IDH wild type	Grade 4	01	1.8%
Astrocytoma- IDH mutant type	Grade 4	01	1.8%
Choroid Plexus Tumor	Grade 2	01	1.8%
TOTAL		55	100%

Table 2: Age wise Histological Distribution of Posterior Fossa Tumors

Tumor Type	<18 Years (n)	> 18Years (n)	Number of cases	Case (%)
Schwannoma	0	16	16	29.1%
Medulloblastoma	8	02	10	18.2%
Pilocytic Astrocytoma	7	01	08	14.5%
Meningioma	0	08	08	14.5%
Posterior fossa A Ependymoma	0	00	00	00
Posterior fossa B Ependymoma	5	00	05	9.1%
Hemangioblastoma	0	04	04	7.3%
High Grade Glioma, NOS	0	01	01	1.8%
Glioblastoma-IDH wild type	0	01	01	1.8%
Astrocytoma- IDH mutant	0	01	01	1.8%

Volume 9, Issue 3; May-June 2026; Page No 152-157

Choroid Plexus Papilloma (Atypical)	0	01	01	1.8%
TOTAL	20	35	55	100%

Table 3: Pediatric Posterior Fossa Tumors- Age-wise Distribution (N=20)

Age Group/ Tumor Type	Medulloblastoma	Pilocytic Astrocytoma	Ependymoma	Total
0-1 months	0	0	0	0
1 month to 1 year	1	0	1	2
1-3 yrs	0	1	1	2
3-5 yrs	2	1	1	4
6-12 yrs	5	2	1	8
13-18 yrs	0	3	1	4
TOTAL	8	7	5	20 (100%)

Table 4: Adult Posterior Fossa Tumors — Age-wise Distribution by Decade (N = 35)

Tumor Type	19-30 yrs	31-40 yrs	41-50 yrs	51-60 yrs	61-70 yrs	71-80 yrs	Total
Schwannoma	1	6	3	3	1	2	16
Medulloblastoma	1	0	1	0	0	0	2
Pilocytic Astrocytoma	1	0	0	0	0	0	1
Meningioma	2	1	1	2	2	0	8
Hemangioblastoma	1	1	1	0	1	0	4
High Grade Glioma, NOS	0	1	0	0	0	0	1
Glioblastoma-IDH wild type	1	0	0	0	0	0	1
Astrocytoma- IDH mutant type	1	0	0	0	0	0	1
Choroid Plexus (Atypical)	0	0	1	0	0	0	1
Total	8	9	7	5	4	2	35

Volume 9, Issue 3; May-June 2026; Page No 152-157