# Factorial Analysis of Pre-Operative Seizures in Meningiomas

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25th Shaukat Khanum Cancer Symposium

## INTRODUCTION

- Meningiomas makes 39.7% of all the primary central nervous system (CNS) tumors
- Albeit meningiomas are extra-axial lesions, they often presents with pre-operative seizures during the course of disease.
- Risk profiling is integral for the stratified seizure management.

## OBJECTIVE

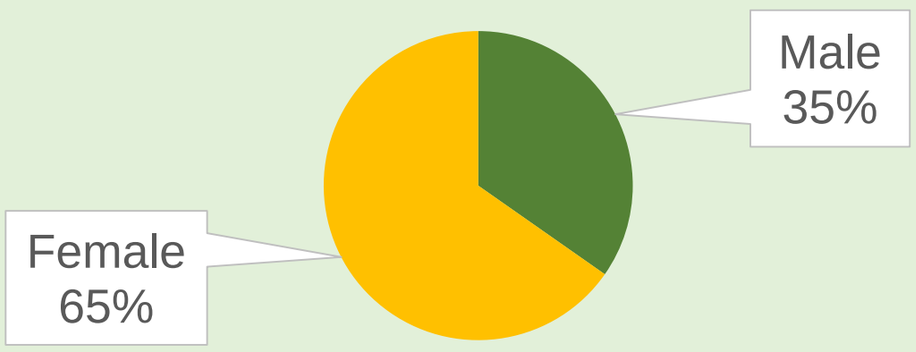
To investigate the pre-operative risk factors that predispose to the development of seizures in meningioma

## METHODOLOGY

- Retrospective observational study.
- Meningioma tumor - Punjab Institute of Neurosciences between January 1st, 2022, and December 31st, 2025.
- Logistic regression models were used to analyze the independent predictors of pre-op seizures.

## RESULTS

### Gender Distribution




- Mean Age **45.98±12.46**

| Characteristics | Preoperative | Postoperative |
|---|---|---|
| GCS | 14.47±1.06 | 14.54±1.13 |
| KPS | 75.69±22.12 | 81.66±30.35 |
| Adjuvant | 4 (5.6%) | 8 (11.1%) |

## RESULTS

- On univariate logistic regression analysis, five variables showed a clinically meaningful association with seizure occurrence ($p < 0.25$), including **age, hypertension, location, tumor size, and peritumoral edema.**
- However on multivariate logistic regression analysis, **hypertension** was found to be the significant predictor of preoperative seizures

### Multivariate Logistic Regression Analysis

| Predictors | OR | B co-eff | 95% CI | p-value |
|---|---|---|---|---|
| HTN | 7.832 | 2.058 | 2.031-30.198 | **0.003** |
| Size | 1.007 | 0.007 | 0.999-1.015 | 0.102 |
| Edema | .430 | -.884 | 0.119-1.551 | 0.280 |
| Location | | | | 0.926 |

- The ROC curve revealed an area under the curve of 86.4%, with a significantly good discrimination ability of the model ($p<0.05$).

## DISCUSSION

- Developing nervous systems of younger age-groups have more plasticity; contributing to the increased cortical activity. Conversely the atrophic changes in geriatric age-group acts as a protective barrier against hyperexcitability and edema development.
- Non-skull base locations - greater contact with the cortex, greater is the chance for electrical activity. Supratentorial cortex has more excitable (glutamatergic) neurons, whereas the infratentorial region has more inhibitory neurons (Purkinjie cells).
- Mantle et al. reported, with each 1cm increase in brain edema, the incidence of brain invasion increases by 20%. This invasion dysregulates the pial-glial barrier, inaugurating the astrocytic response, similar to an intra-axial lesion.
- High blood pressure imposes repeated vascular insult, and together with the degeneration of meningeal and parenchymal vessel walls, the integrity of vessel wall compromises, contributing to the perivascular edema. Small vessel disease also exacerbates micro-infarcts. This ischemic injury results in the accumulation of calcium intracellularly and glutamate toxicity, thereby increasing the propensity for seizures.

## CONCLUSION

***Younger age-group and hypertensive patients were more likely to develop pre-operative seizures. Tumor contributing factors were peritumoral edema, lesion size, and its intracranial location.***

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