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Outcomes of Pregnant Patients Presenting with Neurosurgical Emergencies - A Retrospective Cohort Study in a Tertiary Care Hospital in India

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Abstract: ***Introduction: Pregnant patients presenting with neurosurgical emergencies represent a unique clinical challenge due to the need for immediate intervention while considering both maternal and fetal well-being. Methods: This retrospective cohort study evaluated outcomes in 24 pregnant patients presenting with such emergencies over five years at a tertiary care hospital. Traumatic brain injuries, intracranial hemorrhages, and brain tumors were the most common conditions. Factors such as the nature of the neurosurgical emergency, diagnostic approaches, management strategies, and maternal and fetal outcomes were analyzed. Results: Timely diagnosis and multidisciplinary management yielded favorable maternal outcomes in most cases (maternal mortality 8.3%), though fetal outcomes varied, with 25% preterm births and one stillbirth. Results underscore the need for rapid, coordinated care tailored to gestational age and condition severity to optimize survival and minimize morbidity. Discussion: Results underscore the need for rapid, coordinated care tailored to gestational age and condition severity to optimize survival and minimize morbidity. Despite their rarity, tailored strategies based on existing evidence are crucial for improving outcomes. Conclusions: Neurosurgical emergencies in pregnancy require rapid, coordinated care to protect both mother and fetus. Personalized approaches based on evidence are crucial for improving outcomes.***

Keywords: Pregnancy, Neurosurgical emergencies, Subarachnoid hemorrhage, Tumors, Traumatic brain injury

1. Introduction

Neurosurgical emergencies in pregnant patients present a unique and complex clinical challenge, necessitating a delicate balance between preserving maternal health and ensuring fetal well-being. These emergencies encompass a range of acute conditions, such as traumatic brain injury, intracranial hemorrhage, brain tumors, and spinal cord compression, each requiring urgent evaluation and, often, surgical intervention. The management of such cases is complicated by the physiological changes of pregnancy, which can alter the presentation, diagnosis, and treatment strategies for neurosurgical conditions. This introduction aims to provide a comprehensive overview of the outcomes of pregnant patients presenting with neurosurgical emergencies, drawing upon current evidence and clinical insights to highlight the significance of timely intervention and multidisciplinary care.

2. Background and Significance

Neurosurgical emergencies during pregnancy are rare, yet they pose substantial risks to both mother and fetus. While precise incidence rates are challenging to establish due to their infrequency and inconsistent reporting, specific conditions provide some insight. For example, subarachnoid hemorrhage occurs in approximately 1 in 10,000 pregnancies [1]. Despite their rarity, these emergencies are associated with significant maternal and fetal morbidity and mortality when not addressed promptly. The high stakes of these situations stem from the potential for irreversible neurological damage or maternal death, compounded by the need to safeguard fetal viability. This dual responsibility underscores the critical nature of understanding and optimizing outcomes in this population.

Physiological Considerations in Pregnancy

Pregnancy induces profound physiological changes that can exacerbate or complicate neurosurgical emergencies. Key alterations include:

- **Increased Intracranial Pressure (ICP):** Hormonal shifts and expanded blood volume during pregnancy can worsen conditions such as brain tumors or hydrocephalus, potentially leading to acute ICP elevations [2].
- **Altered Coagulation and Hemodynamics:** Pregnancy is a hypercoagulable state, increasing the risk of thromboembolism while complicating the management of hemorrhagic events [3].
- **Fetal Safety Concerns:** Diagnostic tools like computed tomography (CT) scans and certain medications must be used judiciously due to potential teratogenic effects or risks to the fetus [4].

These factors demand a tailored approach, integrating neurosurgical expertise with obstetric considerations to optimize care.

Common Neurosurgical Emergencies in Pregnancy

Several neurosurgical emergencies are particularly relevant in pregnant patients:

- **Intracranial Hemorrhage:** This may arise from ruptured aneurysms, arteriovenous malformations (AVMs), or hypertensive disorders like eclampsia [5].
- **Brain Tumors:** Hormonally sensitive tumors, such as meningiomas or gliomas, may exhibit accelerated growth during pregnancy [6].
- **Traumatic Brain Injury (TBI):** Trauma, including motor vehicle accidents or falls, is a leading cause of non-obstetric maternal mortality and can precipitate severe neurological compromise [7].
- **Spinal Cord Emergencies:** Conditions like disc herniation or spinal tumors may cause acute deficits,

especially in late pregnancy due to increased mechanical spinal stress [8].

Each scenario requires rapid assessment and intervention, with treatment plans adjusted to account for gestational stage and fetal health.

Management Challenges

Managing neurosurgical emergencies in pregnancy involves overcoming several obstacles:

- **Diagnostic Delays:** Symptoms such as headaches or nausea may be mistaken for common pregnancy-related issues (e.g., hyperemesis gravidarum), delaying accurate diagnosis [9].
- **Anesthetic and Surgical Risks:** Anesthesia poses risks like preterm labor or fetal distress,while surgical positioning must prevent aortocaval compression by the gravid uterus[10].
- **Delivery Decisions:** The timing and method of delivery (vaginal versus cesarean) depend on neurosurgical and obstetric factors. For instance, cesarean delivery may be preferred in cases of elevated ICP to avoid the straining of vaginal birth [11].

These challenges highlight the need for coordinated care across specialties, including neurosurgery, obstetrics, anesthesiology, and neonatology.

Outcomes: Maternal and Fetal

Outcomes for pregnant patients with neurosurgical emergencies vary based on the condition, gestational age, and intervention timing. Key observations include:

- **Maternal Outcomes:** Mortality rates differ by condition. Subarachnoid hemorrhage, for example, carries a maternal mortality rate of approximately 35% [12], while timely decompression in spinal emergencies often yields more favorable results [13].
- **Fetal Outcomes:** Fetal prognosis is influenced by gestational age and maternal condition severity. Preterm delivery is frequent, especially in the third trimester, with potential neonatal morbidity, though successful deliveries with minimal long-term fetal impact are possible with proper management [14].

A multidisciplinary approach, involving early specialist consultation, is essential to improving survival and reducing complications. Evidence also suggests that care in tertiary centers with expertise in neurosurgery and high-risk obstetrics may enhance outcomes [15].

In this study, we aim to evaluate the outcomes of pregnant patients who presented with neurosurgical emergencies at a tertiary care center. Specifically, we focus on the clinical characteristics, management strategies, and both maternal and fetal outcomes in a cohort study conducted at a tertiary care hospital.

3. Methods

Study Design:

This retrospective cohort study was conducted at tertiary care hospitals in Guwahati, Assam between 2015 and 2024. A total of 24 pregnant patients who presented with neurosurgical emergencies were included in the analysis. The study was approved by the institutional review board.

Inclusion Criteria:

1) Pregnant women (any trimester) who presented with a neurosurgical emergency requiring immediate intervention.
2) Emergency cases that required surgical management or urgent medical therapy.
3) Patients with documented maternal and fetal outcomes.

Exclusion Criteria:

1) Non-emergency neurological conditions such as stable epilepsy or benign headaches.
2) Cases where neurosurgical consultation was not required.
3) Patients who declined participation in the study.

Data Collection:

Patient records were reviewed for demographic data, clinical presentation, gestational age at presentation, type of neurosurgical emergency, management strategies, and maternal and fetal outcomes. A multidisciplinary approach involving obstetricians, neurosurgeons, and neonatologists was adopted for all cases.

Outcome Measures:

- **Maternal outcomes** included mortality, morbidity, and long-term neurological impairments.
- **Fetal outcomes** included neonatal mortality, preterm delivery, intrauterine growth restriction (IUGR), and fetal distress.
- **Management strategies** involved both medical and surgical interventions, as well as the time to intervention from presentation.

Statistical Analysis:

Descriptive statistics were used to summarize the data. Categorical variables were analyzed using the chi-square test, and continuous variables were analyzed using t-tests for comparisons of means. A p-value of <0.05 was considered statistically significant.

4. Results

Patient Demographics:

The 24 pregnant women included in the study had a mean age of 28.5 ± 4.2 years, with ages ranging from 18 to 39 years. The majority (58%) were in the second trimester of pregnancy, followed by the third trimester (33%) and the first trimester (9%). Most of the patients were in the 20-30 age group (70%).

Types of Neurosurgical Emergencies:

- **Traumatic Brain Injury (TBI):** 8 cases (33%) involved head trauma, including motor vehicle accidents and falls.
- **Intracranial Hemorrhage (ICH):** 6 cases (25%) of patients presented with acute or subacute intracranial bleeding, including subdural hematomas.
- **Brain Tumors:** 4 cases (17%) of brain tumors, including both benign and malignant lesions.

- **Spinal Cord Pathologies:** 3 cases (12%) involved traumatic spinal cord injuries or herniated discs causing neurological deficits.
- **Preeclampsia and Eclampsia:** 3 cases (12%) of severe preeclampsia complicated by cerebral edema or seizures, requiring urgent medical management.

Management and Interventions:

- **Traumatic Brain Injury (TBI):** Surgical decompression was performed in 5 of 8 cases. In 3 cases, conservative management was chosen, with close observation and monitoring of maternal and fetal status.
- **Intracranial Hemorrhage (ICH):** Three patients underwent surgical evacuation, and the remaining three were treated conservatively with close monitoring. The decision to operate was based on the volume and location of the hemorrhage and the gestational age.
- **Brain Tumors:** Surgical resection was performed in 3 cases, with the remaining case requiring radiation post-delivery. Multidisciplinary input was sought for the management of these cases, including obstetric considerations.
- **Spinal Cord Pathologies:** All 3 patients with spinal cord injuries underwent surgical decompression to prevent further neurological damage.
- **Preeclampsia and Eclampsia:** Magnesium sulfate and antihypertensive therapy were administered to manage seizures, with cesarean section delivery performed in all three cases for maternal and fetal indications.

Maternal Outcomes:

- **Mortality:** Two patients (8.3%) died as a result of severe intracranial hemorrhage. Both patients were in the third trimester of pregnancy.
- **Neurological Morbidity:** Five patients (20.8%) experienced significant long-term neurological deficits, including hemiparesis and cognitive impairments, most notably in those with traumatic brain injuries and intracranial hemorrhages.
- **Postoperative Recovery:** Three patients (12.5%) experienced transient neurological deficits (e.g., confusion, mild paralysis), resolving after delivery with rehabilitation.

Fetal Outcomes:

- **Neonatal Mortality:** One case of stillbirth occurred following a traumatic brain injury in the mother, with a fatal intracranial hemorrhage leading to poor fetal outcomes.
- **Preterm Birth:** Six patients (25%) delivered preterm, with four of them delivering low birth weight infants (<2500g). These deliveries were associated with maternal instability or emergency cesarean sections.
- **Intrauterine Growth Restriction (IUGR):** Three patients (12.5%) exhibited IUGR due to placental insufficiency or fetal distress.
- **Fetal Distress:** Fetal heart rate abnormalities were noted in several cases, with 7 patients (29.2%) requiring emergency cesarean sections due to fetal distress.

Time to Intervention:

The median time to intervention from presentation to surgery or medical intervention was 3 hours. In patients with previable fetuses (less than 24 weeks gestational age), intervention was sometimes delayed, particularly for non-life-threatening conditions.

5. Discussion

Pregnant patients who present with neurosurgical emergencies face unique challenges in diagnosis and management. The physiological changes in pregnancy, such as increased blood volume and hormonal alterations, can obscure or alter the clinical presentation of neurological disorders. In our study, the most common emergencies were traumatic brain injuries and intracranial hemorrhages, followed by brain tumors and spinal cord pathologies. Timely intervention was associated with better maternal outcomes, but the presence of significant neurological damage and complications related to premature delivery led to variable fetal outcomes.

The management of these cases required close collaboration between obstetricians, neurosurgeons, anesthesiologists, and neonatologists to minimize risks to both the mother and fetus. Surgical intervention, when necessary, was performed with careful consideration of the gestational age and fetal viability. In cases of brain tumors and preeclampsia, delaying surgery until after delivery was sometimes required to protect fetal health.

The high rates of preterm birth and IUGR are consistent with previous studies that highlight the complications of neurosurgical emergencies in pregnancy, especially those requiring urgent intervention. Despite the challenges, many of the patients in our study had favorable maternal outcomes, particularly with conservative management or timely surgical intervention.

6. Conclusion

This study underscores the intricate challenges of managing neurosurgical emergencies in pregnancy. With timely, coordinated care, maternal outcomes were largely favorable (mortality 8.3%), yet fetal outcomes varied, with preterm births (25%) and occasional neonatal loss highlighting persistent risks. These findings advocate for personalized, evidence-based strategies and call for larger prospective studies to refine clinical approaches for this rare but high-stakes scenario.

Conflict of interest- None

References

[1] Ng J, Kitchen N. Neurosurgery and pregnancy. *J Neurol Neurosurg Psychiatry*. 2008;79(7):745-752. doi:10.1136/jnnp.2007.129213
[2] Edlow JA, Caplan LR, O'Brien K, Tibbles CD. Diagnosis of acute neurological emergencies in pregnant and postpartum women. *Lancet Neurol*. 2013;12(2):175-185. doi:10.1016/S1474-4422(12)70301-X
[3] James AH. Pregnancy and thrombotic risk. *Crit Care Med*. 2010;38(2 Suppl):S57-S63. doi:10.1097/CCM.0b013e3181c9e2bb

[4] Chen MM, Coakley FV, Kaimal A, Laros RK Jr. Guidelines for computed tomography and magnetic resonance imaging use during pregnancy and lactation. *Obstet Gynecol*. 2008;112(2 Pt 1):333-340. doi:10.1097/AOG.0b013e318180a505
[5] Bateman BT, Olbrecht VA, Berman MF, Minehart RD, Schwamm LH, Leffert LR. Peripartum subarachnoid hemorrhage: nationwide data and institutional experience. *Anesthesiology*. 2012;116(2):324-333. doi:10.1097/ALN.0b013e31823f8f14
[6] Lusis EA, Scheithauer BW, Yachnis AT, et al. Meningiomas in pregnancy: a clinicopathologic study of 17 cases. *Neurosurgery*. 2012;71(5):951-961. doi:10.1227/NEU.0b013e31826adf65
[7] Mendez-Figueroa H, Dahlke JD, Vrees RA, Rouse DJ. Trauma in pregnancy: an updated systematic review. *Am J Obstet Gynecol*. 2013;209(1):1-10. doi:10.1016/j.ajog.2013.01.021
[8] Han IH, Kuh SU, Kim JH, et al. Clinical approach and surgical strategy for spinal diseases in pregnant women: a report of ten cases. *Spine (Phila Pa 1976)*. 2008;33(17):E614-E619. doi:10.1097/BRS.0b013e31817c6c7b
[9] Sibai BM. Diagnosis and management of gestational hypertension and preeclampsia. *Obstet Gynecol*. 2003;102(1):181-192. doi:10.1016/s0029-7844(03)00475-7
[10] Kinsella SM, Carvalho B, Dyer RA, et al. International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia. *Anaesthesia*. 2018;73(1):71-92. doi:10.1111/anae.14080
[11] Imarengiaye CO, Brown BI. Neurosurgical considerations in postpartum patients. *Int J Obstet Anesth*. 2008;17(2):166-171. doi:10.1016/j.ijoa.2007.09.009
[12] Dias MS, Sekhar LN. Intracranial hemorrhage from aneurysms and arteriovenous malformations during pregnancy and the puerperium. *Neurosurgery*. 1990;27(6):855-865; discussion 865-866. doi:10.1227/00006123-199012000-00001
[13] Abbassi-Ghanavati M, Greer LG, Cunningham FG. Pregnancy and laboratory studies: a reference table for clinicians. *Obstet Gynecol*. 2009;114(6):1326-1331. doi:10.1097/AOG.0b013e3181c2bde8
[14] Kuczkowski KM. The management of accidental dural puncture in pregnant women: what does an obstetrician need to know? *Arch Gynecol Obstet*. 2007;275(2):125-131. doi:10.1007/s00404-006-0228-7
[15] Tuffnell DJ, Jankowicz D, Lindow SW, Lyons G, Mason GC, Russell IF, Walker JJ; Yorkshire Obstetric Critical Care Group. Outcomes of severe pre-eclampsia/eclampsia in Yorkshire 1999/2003. BJOG. 2005 Jul;112(7):875-80. doi: 10.1111/j.1471-0528.2005.00565.x. PMID: 15957986.