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Cerebral Angiographic Characteristics, Clinical Profiles, and Long-Term Outcomes of Obstetric Patients with Spontaneous Intracerebral Hemorrhage: Insights from a Philippine Tertiary Government Hospital

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Abstract

This study describes the clinical profiles, causes, and long-term outcomes of spontaneous intracerebral hemorrhage (ICH) in pregnant women at Vicente Sotto Memorial Medical Center (VSMMC). The investigation aimed to identify risk factors associated with ICH, evaluate maternal and fetal outcomes, and examine correlations between clinical characteristics and patient outcomes. A retrospective descriptive design was employed, reviewing the charts of obstetric patients with confirmed intraparenchymal hemorrhage from January 2015 to December 2023. Data collection focused on demographics, clinical history, and outcomes, with statistical analyses performed to determine significant patterns. The study analyzed 60 cases, revealing that 48% of patients improved or recovered while 52% experienced mortality. Most cases involved women aged 26-40 years, with intraparenchymal hemorrhage (93%) being the most prevalent type. The third trimester presented higher mortality rates (40%), particularly among patients with eclampsia (57%). Emergency cesarean sections (65%) and medical management (57%) were common interventions. Pregnancy-related hypertension emerged as a significant factor impacting maternal outcomes. Fetal outcomes included 47% term deliveries and 10% fetal or neonatal deaths, highlighting the severe implications of ICH during pregnancy. The findings underscore the association of eclampsia, third-trimester presentation, and emergent cesarean sections with higher maternal mortality. Effective management during the third trimester is crucial, particularly for patients with comorbidities such as eclampsia. The nearly equal distribution of maternal recovery and mortality highlights the unpredictable course of ICH in obstetric patients. Diverse fetal outcomes, ranging from term and preterm deliveries to fetal or neonatal deaths, emphasize the dual challenges ICH poses to maternal and fetal health.

Keywords: Spontaneous Intracerebral Hemorrhage (ICH), Maternal outcomes, Intraparenchymal hemorrhage (IPH), Eclampsia, Pregnancy-related hypertension

Introduction

Spontaneous Intracerebral Hemorrhage (ICH) is a rare but severe condition in which bleeding occurs in the brain's parenchyma, with the potential to extend into the ventricles and subarachnoid space. While hemorrhagic strokes are uncommon during pregnancy, their occurrence poses significant risks to both maternal and fetal health. According to James et al. [1], hemorrhagic strokes occur at a rate of 1.4 per 100,000 deliveries, while ischemic strokes occur at a rate of 34.2 per 100,000 deliveries in pregnant women. Common causes of ICH during pregnancy include vascular abnormalities, preeclampsia/eclampsia, and coagulopathies, with 24% of cases classified as spontaneous ICH, the cause of which remains undetermined [2, 3]. Several risk factors for ICH, such as postpartum infections, gestational hypertension, thrombophilia, and heart disease, have been identified, highlighting the complex nature of this condition.

Given the unique challenges that pregnancy presents in terms of diagnostic imaging and treatment options and the low incidence of spontaneous ICH, there is a lack of standardized management guidelines. Additionally, the urgency of addressing both maternal and fetal health requires careful, individualized care. In light of the absence of clinical guidelines and limited research in this area, this retrospective study aims to characterize the clinical features, causes, management, and outcomes of spontaneous ICH in pregnant women at Vicente Sotto Memorial Medical Center (VSMMC). Currently, no baseline data exists regarding spontaneous ICH in pregnant women in the local setting, making this study crucial for developing evidence-based guidelines to help reduce morbidity and mortality associated with this condition.

The significance of this study lies in its potential to provide a deeper understanding of spontaneous ICH in pregnant women, a condition often overshadowed by other obstetric concerns. By evaluating clinical profiles, angiographic features, and long-term outcomes, this research will offer insights into the causes and management of ICH in this population, ultimately benefiting both maternal and fetal health. The findings will help guide healthcare providers in making informed decisions, improving the overall care for pregnant women experiencing spontaneous ICH, and formulating strategies to prevent adverse outcomes.

Literature Review

The literature review underscores that pregnancy-related intracerebral hemorrhage (ICH), though rare, poses severe risks to both maternal and fetal health. It identifies pre-eclampsia, eclampsia, and vascular abnormalities as primary causes, with approximately 25% of cases remaining unexplained. Hypertension emerges as a critical risk factor, significantly increasing the likelihood of ICH during pregnancy, particularly in the third trimester and early postpartum period. Diagnostic imaging, including non-contrast CT and MRI, is highlighted for its essential role in detecting ICH while minimizing fetal radiation exposure. Despite limited evidence, studies consistently show that timely diagnosis and careful clinical management are pivotal in mitigating complications.

Management strategies for pregnancy-related ICH are generally similar to those for non-pregnant patients but require specific considerations due to maternal and fetal health concerns. Multidisciplinary care involving neurosurgical, obstetric, and neurological specialists is emphasized to ensure coordinated and effective treatment. While cesarean delivery is often recommended for obstetric reasons, assisted vaginal delivery may be appropriate in cases where intracranial pressure concerns arise. The literature underscores the unpredictable nature of ICH outcomes, ranging from recovery to maternal or fetal death, emphasizing

the need for vigilant monitoring and individualized care approaches to improve prognosis for both mother and child.

Research Objective

To evaluate the clinical profile and long-term outcomes of obstetric patients with spontaneous intracerebral hemorrhage (ICH).

Methodology

StudyDesign: Retrospective cohort study

Study Setting: Department of Neurosurgery, Vicente Sotto Memorial Medical Center

Population and Sampling

The study population consisted of all pregnant patients admitted to VSMMC from January 2015 to December 2023, who met the inclusion criteria based on clinical symptoms (headache, nausea, vomiting, decreased sensorium) and confirmed by imaging showing intraparenchymal hemorrhage (IPH), intraventricular extension, and/or subarachnoid hemorrhage. Exclusion criteria included patients not referred to the Neurosurgery service or those without sufficient clinical data.

The study employed a retrospective comprehensive sampling technique, reviewing all patient charts and angiogram results for the specified time frame. This approach ensured an exhaustive collection of data relevant to the target population.

Research Instrument

Data collection was facilitated through a structured checklist (Appendix A) that recorded the clinical profiles of each patient, including age, gestational age (in weeks), types of ICH, time of presentation, obstetrical history, maternal comorbidities, angiographic results, and obstetrical and neurosurgical management. The checklist also captured potential risk factors such as hypertension, gestational hypertension, gestational diabetes, and arteriovenous malformation (AVM).

Data Collection Procedure

Following approval from the VSMMC Institutional Review Board (IRB), data were collected retrospectively from clinical records and angiogram results of patients admitted to VSMMC between January 2015 and December 2023. Data included demographic details, clinical symptoms, imaging results, maternal comorbidities, obstetric and neuro-surgical management, and associated outcomes (both maternal and fetal). The data were compiled, verified, and analyzed to draw meaningful conclusions.

Data Processing and Analysis

Statistical analysis included descriptive statistics such as frequency and percentage distributions to summarize the clinical characteristics and outcomes. The analysis of continuous variables with normal distribution was performed using two-sample t-tests, while categorical data were analyzed using the $\chi 2$ test or Fisher's exact test. Logistic regression was employed to assess the relationships between clinical features, risk factors, and patient outcomes. A p-value of <0.05 was considered statistically significant.

Table 1. Demographic, Clinical and Management of Obstetric Patients with Spontaneous Intracerebral Hemorrhage (N = 60)

Patients Demographic	Total (N = 60)	Maternal Outcomes	
		Improved/Recovered (N = 29)	Death (N = 31)
Age			
15 years old – 20 years old	6 (10%)	1 (2%)	5 (8%)
21 years old – 25 years old	6 (10%)	4 (7%)	2 (3%)
26 years old – 30 years old	15 (25%)	9 (15%)	6 (10%)
31 years old – 35 years old	18 (30%)	7 (12%)	11 (18%)
36 years old – 40 years old	11 (18%)	5 (8%)	6 (10%)
41 years old and above	4 (7%)	3 (5%)	1 (2%)
Location of ICH			
IPH	56 (93%)	26 (43%)	30 (50%)
SAH	4 (7%)	3 (5%)	1 (2%)
Time of Presentation Antepartum			
First Trimester	9 (15%)	4 (7%)	5 (8%)
Second Trimester	8 (13%)	6 (10%)	2 (3%)
Third Trimester	43 (72%)	19 (32%)	24 (40%)
Obstetrical History			
Nulliparous	3 (5%)	0 (0%)	3 (5%)
Multiparous	57 (95%)	29 (48%)	28 (47%)
Maternal Comorbidities			
Eclampsia	34 (57%)	16 (27%)	18 (30%)
No Comorbidities	8 (13%)	4 (7%)	4 (7%)

Not reported	18 (30%)	9 (15%)	9 (15%)
Chronic Hypertension			
Yes	24 (40%)	14 (23%)	10 (17%)
No	6 (10%)	1 (2%)	5 (8%)
Not reported	30 (50%)	14 (23%)	16 (27%)
Pregnancy-related hypertension			
Gestational	1 (2%)	0 (0%)	1 (2%)
Pre-eclampsia	15 (25%)	7 (12%)	8 (13%)
Eclampsia	14 (23%)	7 (12%)	7 (12%)
HELLP syndrome	8 (13%)	2 (3%)	6 (10%)
Not reported	22 (37%)	13 (22%)	9 (15%)
Obstetrical management			
Emergent CS	39 (65%)	20 (33%)	19 (32%)
Vaginal delivery	18 (30%)	8 (13%)	10 (17%)
Not reported	3 (5%)	1 (2%)	2 (3%)
Neurosurgical management			
Medical Management	34 (57%)	15 (25%)	19 (32%)
Evacuation of Hematoma	16 (27%)	6 (10%)	10 (17%)
EVD insertion	1 (2%)	0 (0%)	1 (2%)
Cerebral Catheter Angiogram	8 (13%)	7 (12%)	1 (2%)
Clipping of Aneurysm	1 (2%)	1 (2%)	0 (0%)

Table 2. Obstetric Patient's Risk Factors for ICH

Risk Factors	Total (N = 60)	Maternal Outcomes	
		Improved/Recovered (N = 29)	Death (N = 31)
	Frequency (%)		
History of hypertension	13 (22%)	5 (8%)	8 (13%)
Hyperlipidemia	1 (2%)	1 (2%)	0 (0%)
Pregnancy- related hypertension	45 (75%)	22 (37%)	23 (38%)
Pseudoaneurysm	1 (2%)	1 (2%)	0 (0%)
Total	**60 (100%)**	**29 (48%)**	**31 (52%)**

Table 3: Obstetric Patient's Outcomes

Outcomes	Frequency (%)
Maternal outcome	
Improved/Recovered	29 (48%)
Death	31 (52%)
Fetal outcome	
Term Delivery	28 (47%)
Preterm Delivery	21 (35%)
Fetal or Neonatal death	6 (10%)
Expectant	1 (2%)
Not reported	4 (7%)

Table 4. Association of Patient Clinical Characteristics and Maternal Outcome

Patient Clinical characteristics	Estimate	Standard Error	Odds Ratio	95% C.I. [LB, UB]	P value
Age	0.66	0.039	1.935	[1.230, 4.346]	<0.05a
Location of ICH (Ref: SAH)					
IPH	1.242	1.185	3.463	[0.014, 2.412]	0.295a
Time of Presentation Antepartum (Ref: First Trimester)					
Second Trimester	-1.322	1.057	0.267	[1.027, 1.942]	<0.05a
Third Trimester	0.234	0.738	1.264	[1.223, 4.336]	<0.05a
Obstetrical History (Ref: Multiparous)					
Nulliparous	1.66	1.385	5.259	[0, 0.44]	0.99a
Maternal Comorbidities (Ref: No Comorbidities)					
Eclampsia	0.894	0.786	2.445	[1.182, 4.326]	<0.05a
Not reported	-0.118	0.583	0.889	[0.28, 2.813]	0.84a
Chronic Hypertension (Ref: No)					
Yes	-1.946	1.171	0.143	[0.007, 1.066]	0.097a
Not reported	-1.476	1.155	0.229	[0.011, 1.646]	0.201a
Pregnancy-related hypertension (Ref: Eclampsia)					
Gestational	1.54	1.455	4.665	[0, 0.22]	0.991a
Pre-eclampsia	0.134	0.744	1.143	[1.263, 5.022]	<0.05a
HELLP syndrome	1.099	0.976	3	[1.486, 25.722]	<0.05a

Not reported	-0.368	0.688	0.692	[0.176, 2.685]	0.59
Obstetrical management (Ref: Emergent CS)					
Vaginal delivery	0.274	0.572	1.316	[0.429, 4.133]	0.632
Not reported	0.744	1.266	2.105	[0.187, 47.524]	0.556
Neurosurgical management (Ref: Cerebral Catheter Angiogram)					
Medical Management	0.182	1.123	1.200	[1.367, 5.434]	<0.05
Evacuation of Hematoma	0.457	1.187	1.579	[1.543, 247.785]	<0.05
EVD insertion	1.85	23.99	6.36	[0, 0.33]	0.994
Clipping of Aneurysm	-1.43	23.99	0.239	[0.032, 7.567]	0.995

Results

The findings from this study underscore the complexity of obstetric intracerebral hemorrhage (ICH) and its profound impact on both maternal and fetal outcomes. This study's results, which align with previous research, highlight the significant role of maternal comorbidities such as hypertension (including chronic hypertension), eclampsia, and coagulopathies in exacerbating the risk of ICH during pregnancy and the postpartum period. As noted in earlier studies [4,5], hypertensive disorders and coagulopathies are strong predictors of maternal morbidity and mortality in obstetric populations. The study provides novel insights into how these comorbidities, along with demographic factors such as maternal age, contribute to the increased maternal mortality associated with obstetric ICH. Specifically, the significant association between a history of hypertension and poorer maternal outcomes, particularly in older women and those with chronic hypertension, adds to the growing body of literature on the risks associated with advanced maternal age and hypertension in pregnancy [6,7,8], The study's findings also emphasize the necessity of careful clinical management, including timely delivery interventions, such as cesarean sections, to mitigate the impact of ICH on maternal and fetal health [9,10].

A notable aspect of this study is its contribution to understanding the relationship between specific risk factors and maternal outcomes, particularly regarding the limited influence of hyperlipidemia and pseudoaneurysm on maternal prognosis. These findings are significant because they suggest that while these risk factors are present in some patients, they do not substantially affect maternal survival rates, which could inform clinical decision-making. Conversely, the strong correlation between pregnancy-related hypertension and maternal mortality underscores the need for careful monitoring and management of hypertensive disorders during pregnancy to improve patient outcomes [5,11]. Additionally, the results indicate that most maternal strokes occur in the postpartum period, which can lead to delayed interventions and poorer outcomes, emphasizing the importance of extended monitoring after delivery, particularly for patients with risk factors like hypertension and coagulopathies [4,12].

The study also contributes valuable data on fetal outcomes, with a higher incidence of preterm deliveries and fetal or neonatal deaths in cases of maternal ICH. This finding adds to the existing evidence on the vulnerability of the fetus in such high-risk pregnancies, calling for enhanced neonatal care and early intervention strategies to address the risks posed by preterm birth and fetal distress [9,13]. Moreover, the

results reinforce the importance of comprehensive patient management, taking into account both maternal and fetal health, to improve overall survival rates and reduce adverse outcomes.

This study's significance lies not only in its confirmation of existing theories regarding the causes and risks of obstetric ICH but also in its potential to guide clinical practice by highlighting the importance of specific risk factors and outcomes. The study provides a detailed examination of how maternal and fetal health can be better managed in the context of obstetric ICH, offering critical insights for future research and clinical interventions aimed at improving the prognosis for both mothers and their babies. Additionally, the study's findings emphasize the need for further exploration of the role of maternal age and chronic hypertension in the context of obstetric ICH, to reduce maternal and fetal morbidity and mortality. The significance of this study lies in its contribution to a better understanding of obstetric ICH, which can help clinicians make more informed decisions, ultimately improving patient outcomes in this high-risk population [14,15,16].

Conclusions:

This study provides valuable insights into managing obstetric patients with intracerebral hemorrhage (ICH), highlighting the significant association of eclampsia, third-trimester presentations, and emergent cesarean sections with higher maternal mortality rates. Timely management of eclampsia and vigilant monitoring of patients with pre-existing hypertension are critical to improving outcomes. The findings also underscore the complex and unpredictable nature of maternal and fetal outcomes, with cases ranging from recovery to mortality, preterm deliveries, and fetal or neonatal deaths, emphasizing the need for individualized care.

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