

Original Research

A study on Radiological investigation of cerebrovascular disease in hypertension during pregnancy

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ABSTRACT:

Introduction: Risk factors for stroke during pregnancy and the postpartum period include high blood pressure during pregnancy, HELLP syndrome (a condition characterized by the breakdown of red blood cells, elevated liver enzymes, and low platelet count), frequent vomiting, and changes in red blood cell breakdown and the tendency to form blood clots in late pregnancy and after giving birth. **Materials and Methods:** We additionally examined CVDs that are specific to certain types, including myocardial infarction, cerebrovascular illness, stroke, heart failure, atrial fibrillation, hypertensive disease, deep vein thrombosis, pulmonary embolism, rheumatic heart disease, and peripheral arterial disease. **Results:** In this study, the majority of the patients experienced seizures in 31 cases (57%). This was followed by blurred vision in 17 cases (30%), severe headache in 6 cases (7%), unconsciousness in 5 cases (6%), and sudden loss of vision, weakness on the left side of the body, and altered sensorium in one case each (3%). The average length of seizures is 1.32 days, blurred vision lasts for 1.35 days, and severe headache typically lasts for 1.6 days. high blood pressure has been identified as a significant risk factor for the development of cerebrovascular illness. **Conclusion:** There should be increased awareness and widespread use of CT/MRI in cases where seizures occur during pregnancy/postpartum, as well as in cases where loss of consciousness is observed.

Keywords: Computed Tomography, MRI, Cerebrovascular Disease, Hypertensive Disease.

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INTRODUCTION

Cerebrovascular disorders can be categorized as ischemic stroke, subarachnoid hemorrhage, eclamptic encephalopathy, postpartum cerebral angiopathy, and cerebral venous thrombosis.¹ Various imaging studies can be used to assess cerebrovascular disease, including computed tomography (CT) with or without contrast, CT angiography or CT venography, magnetic resonance imaging (MRI) with or without contrast, magnetic resonance angiography, or magnetic resonance venography. Additional studies that aid in determining the mechanism of disease include electrocardiography, transesophageal echocardiography with or without agitated saline echo contrast, and transcranial Doppler. In certain situations, traditional arteriography or lumbar puncture may offer more details; these examinations are usually useful in assessing inflammation (arteriography and lumbar puncture) or infection (lumbar puncture). Radiation exposure is a constant worry for healthcare providers who are taking care of

pregnant patients due to the potential harmful consequences of radiation exposure on the developing fetus.²

Risk factors for stroke during pregnancy and the postpartum period include high blood pressure during pregnancy, HELLP syndrome (a condition characterized by the breakdown of red blood cells, elevated liver enzymes, and low platelet count), frequent vomiting, and changes in red blood cell breakdown and the pre-blood clotting state in late pregnancy and after giving birth.³ In addition, factors such as having many children, getting pregnant at an older age, having several pregnancies, having diabetes, and experiencing imbalances in water and electrolytes all potentially raise the risk of stroke.^{4,5} Severe cerebrovascular issues linked to pregnancy are a significant issue that can result in the death of both the mother and the unborn child. Moreover, the long-term consequences of these difficulties can have a severe impact on a woman's overall life.⁶ Rapid brain imaging can assist in diagnosing acute stroke,

identifying the cause of stroke, and determining the most effective treatment approaches.

In view of the facts described above, we conducted this study to evaluate the clinical and radiological outcomes of cerebrovascular disorders in women throughout the peripartum period.

MATERIAL AND METHODS

After fulfilling the inclusion criteria, a total of 65 patients were chosen. A comprehensive history was obtained and a clinical examination was conducted. The study was conducted after obtaining approval from the institutional ethical committee and obtaining written consent from all the patients prior to the start of the trial.

OUTCOME OF INTEREST

The variable of interest was early-onset cardiovascular disease (excluding congenital heart disease), which was defined as the initial instance of cardiovascular disease in the DNPR and the Danish Cause of Death Register. Diagnostic codes and surgical codes for cardiovascular disease were provided. We additionally examined CVDs that are specific to certain types, such as myocardial infarction, cerebrovascular illness, stroke, heart failure, atrial fibrillation, hypertensive disease, deep vein thrombosis, pulmonary embolism, rheumatic heart disease, and peripheral arterial disease.

Inclusion criteria for the present study

1. Peripartum females with history of hypertension.
- 2.

Exclusion criteria for the present study

1. Patients with history of any systemic illness,
2. Patients with history of any benign or malignant neoplasm involving central nervous system,
3. Patients with cardiac pacemakers or in which MRI is contraindicated.
4. Patients who were not willing to participate in the study.

Obstetric data such as parity, antenatal care, gestational age at the onset of symptoms and the presence of complications like Preeclampsia, eclampsia, anemia, and sepsis were noted.

RESULTS

TABLE1: AGE DISTRIBUTION

Age(years)	Number of patients(65)	Percentage
≤20	8	8%
21–30	46	84%
>30	11	13%
Meanage±SD	26.21±5.80	
Minimum age	18years	
Maximum age	38years	

COVARIATES

Potential factors that could affect the results were chosen using directed acyclic graphs (S1 Fig). These factors include the sex of the individual (male or female), whether they were a singleton (yes or no), the year of the child's birth (ranging from 1977 to 1980, 5-year intervals from 1981 to 2015, and 2016 to 2018), the age of the mother (<20, 20 to 24, 25 to 29, 30 to 34, or ≥35 years), the mother's level of education (0 to 9, 10 to 14, or ≥15 years), the mother's income at the time of birth (no income, divided into three groups), the mother's BMI before pregnancy (underweight <18.5, normal 18.5 to 24.9, overweight 25.0 to 29.9, obese ≥30.0), whether the mother smoked during pregnancy (yes or no), the number of children the mother has had (1, 2, or ≥3), whether the mother was single or cohabitating, the mother's place of residence (Copenhagen, cities with ≥100,000 inhabitants, or other), whether the mother had a history of diabetes, and whether the mother or father had a history of cardiovascular disease before childbirth (yes or no). A missing indicator technique was employed to handle missing values. A comprehensive explanation of the covariates is provided in S3 Text.

STATISTICAL ANALYSIS

Competing risk analysis was used to assess the cumulative incidence of cardiovascular disease (CVD) among offspring who were exposed and unexposed to maternal hypertensive disorders of pregnancy (HDP), with non-CVD mortality considered as the competing events. We employed Cox regression to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) in order to evaluate the relationship between maternal hypertensive disorders of pregnancy (HDP) and cardiovascular disease (CVD) in children, both overall and by specific type. The proportional hazards assumption was evaluated visually using the log-minus-log plot, indicating that there was no apparent breach. We analyzed the interaction between maternal HDP and maternal history of CVD or diabetes to see if the relationship was influenced by maternal CVD or diabetes. In addition, we evaluated the relationship between the timing of preeclampsia start and its severity, including moderate preeclampsia, severe eclampsia, and HELLP syndrome.

TABLE 2: DISTRIBUTION OF GESTATIONAL AGE

Gestational age	Number of patients	Percentage
Gestation period	28	44%
Postnatal	37	59%
Mean±SD	35.10±3.1	

TABLE 3: PRESENTING SYMPTOMS WITH MEAN DURATION

Presenting symptoms	Number of patients	Mean duration(days)
Seizures	31 (57%)	1.35
Blurred Vision	17 (30%)	1.38
Severe Headache	6 (7%)	1.7
Unconsciousness	5 (6%)	1
Sudden Loss of Vision	2(3%)	1
Weakness on Left Side of Body	2(3%)	1
Altered Sensorium	2(3%)	1

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TABLE 4: DISTRIBUTION OF HAEMOGLOBIN

	Range	No. of patients	Percentage
Normal Hb	>10	26	46%
Mild anaemia	8.1-10g/dl	18	29%
Moderate anaemia	6.5-8g/dl	16	25%
Severe anaemia	<6.5g/dl	5	6%
MeanHb±SD	10.7±1.9		

TABLE 5: MEAN SERUM CREATININE AND SERRUM UREA LEVELS LEVELS (MG/DL)

		Grade I hypertension	Grade II hypertension	Grade III hypertension	P value
Mean	Serum Creatinine	0.68±0.15	0.73±0.28	0.79±0.22	0.5
	Serum Urea	27.91±11.71	31.21±7.8	32.71±6.1	0.42

TABLE 10: MRI/CTFINDINGS

	Grade I hypertension	Grade II hypertension	Grade III hypertension	Total
Normal	17	15	9	41
PosteriorReversible Encephalopathy Syndrome	1	4	-	5
Multiple Embolic Infarcts With Haemorrhagic Transformation	-	-	1	1
Intracerebral Hemorrhage	-	1	1	2
Infarct In Occipital Lobe	-	1	1	2
SubarachnoidHaemorrhage	-	-	1	1
Infarct InBasalGanglia	-	-	4	4
Intracranial Haemorrhage With Interventricular Haemorrhage	-	-	1	1
Basal Ganglia Calcification	1	-		1
Acute Infarct With Haemorrhagic Transformation In Right Front oparietal Lobe And Insula	-	-	1	1
Cerebral Vein Thrombosis	-	-	1	1

DISCUSSION

The youngest patient documented is 18 years old, while the oldest patient documented is 38 years old.

The majority of patients fell within the age range of 25 to 30 years. Zibaenazhad MJ and colleagues ⁷It was mentioned that age plays a significant role in the

occurrence of hypertension problems during pregnancy. The average age of patients was 25.26 years. Prabhu T and Bai R⁸ Reported that during their investigation, the average age at the presentation was 22 years. Bashiri and colleagues⁹ The researchers found that the average age of mothers when they were diagnosed was 28 years old in their investigation of the effects of Cerebrovascular Accidents during Pregnancy on maternal and newborn outcomes. The average age indicated by these studies is about the same as our study.

The highest number of patients recorded in our study were from the postnatal period (58%) and patients. For pregnant patients, the average gestational age was 34.14 weeks.

In the research conducted by Bashiri A et al⁹ The average gestational age reported was 35.7 weeks for singleton pregnancies and 34 weeks for twin pregnancies.

Srinivasan K reported it.¹⁰ The incidence of CVT during the postpartum period is approximately 10-12 times higher in India compared to western countries. Possible factors contributing to the high occurrence in Asian countries may include the presence of severe anemia and the cultural practice of limiting fluid intake after childbirth.⁶ Several studies have indicated that there is an elevated risk of stroke during the postpartum period.¹¹⁻¹³

In this study, the majority of the patients experienced seizures in 31 cases (57%). This was followed by blurred vision in 17 cases (30%), severe headache in 6 cases (7%), unconsciousness in 5 cases (6%), and sudden loss of vision, weakness on the left side of the body, and altered sensorium in one case each (3%). The average length of seizures is 1.32 days, blurred vision lasts for 1.35 days, and severe headache typically lasts for 1.6 days. The duration of unconsciousness, sudden loss of eyesight, weakness on the left side of the body, and altered sensorium is one day.

Prabhu T and Bai R⁸ found that the most frequent symptom seen was seizures, which occurred in 24 patients (92%). Severe headache was experienced in two instances (7.7%) before the stroke occurred. Three instances (11.5%) had fever with elevated body temperature, and one of these cases also developed intrapartum sepsis. 17 individuals were experiencing different levels of impaired consciousness, ranging from a partially awake state to being completely unconscious. Three individuals had symptoms of psychosis. Hemiparesis/hemiplegia was seen in 20 instances (76.9%).

Various underlying mechanisms can be employed to interpret our findings. A suggestion has been made that exposure to a negative environment while in the womb is linked to various cardiovascular outcomes later in life.¹⁴⁻¹⁶ HDP might have a negative impact on abnormal placental growth during the early stages of pregnancy. This could result in a reduced blood supply and oxygen levels for fetal development

starting from the first trimester. Additionally, it may cause an excessive production of antiangiogenic substances from the second trimester, which can hinder the growth of blood vessels and the placenta. Placental ischemia and intrauterine hypoxia would lead to reduced metabolism, underdevelopment of the ventricles and myocardium, and separation of the epicardium in rat fetuses. These atypical elements within the womb might impact the development of the heart later on, leading to negative changes in the structure and function of the circulatory system during both the fetal and postnatal stages. Multiple studies have discovered that infants born to mothers with preeclampsia experience negative alterations in the structure and function of their heart and blood vessels. These changes include systemic vascular dysfunction, reduced measures of microvascular function, and smaller hearts starting from childhood. Besides the mechanisms stated above, factors such as DNA damage and changes in gene activity, an overly active sympathetic nervous system, shared genetic and environmental traits, and lifestyle choices could also play a role in the link between hypertensive disorders of pregnancy (HDP) and cardiovascular disease (CVD) in children.

We discovered increased risks of cardiovascular disease (CVD) among children born to mothers who had both hypertensive disorders of pregnancy (HDP) and a previous history of diabetes or CVD, in comparison to children born to mothers who had neither HDP nor a history of diabetes or CVD. The exact mechanisms and interaction between maternal hypertensive disorders of pregnancy (HDP), maternal history of cardiovascular disease (CVD), and diabetes in relation to the development of CVD in offspring are not well understood. However, more research is needed to investigate the impact of maternal history of diabetes or CVD on the risk of CVD in offspring and to assess the overall burden of multiple health conditions during pregnancy.

A prior study has indicated that severe preeclampsia was found to be a separate risk factor for cardiovascular morbidity in children. A suggestion was made that there were differences in gene expression in the placenta between severe early-onset and late-onset preeclampsia. It was also hypothesized that placentas in the early preeclampsia groups had a higher likelihood of infarction.^{17,18} Based on this research, we noticed that children born to moms with early-onset and severe preeclampsia had a greater chance of developing cardiovascular disease.

CONCLUSION

In this study, high blood pressure has been identified as a significant risk factor for the development of cerebrovascular illness. Therefore, it is vital to prioritize the prompt management of high blood pressure and maintaining normal blood pressure during the peripartum period. In a nation like ours, it is equally crucial to address anemia and prevent

dehydration during the peripartum period. There should be more knowledge and widespread use of CT/MRI in cases where seizures occur during pregnancy/postpartum, as well as in cases when loss of consciousness is evident. Starting anticoagulant treatment early can help stop the thrombus and infarcts from getting worse, which can significantly lower the chances of illness and death.

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