

ORIGINAL ARTICLE

Maternal Risk Factors and Obstetric Characteristics Associated with Severe Preeclampsia in the Puerperal Period

Morsheda Khatun^{1*} , Mst Jannatul Ferdous², Nur- un-Naher Nazme³

Received: 22 September 2026
Accepted: 28 September 2026
Published Online: 3 October 2026

Published by:
Gopalganj Medical College, Gopalganj,
Bangladesh

*Corresponding Author

DOI: 10.5281/zenodo.23124003

Copyright © 2026 The Insight



This article is licensed under a Creative Commons Attribution 4.0 International License.



ABSTRACT

Background: Severe preeclampsia is a multisystem hypertensive disorder associated with serious maternal and obstetric complications. Persistent abnormalities after delivery make the puerperal period an important phase of maternal care. Aim of the study: To assess maternal risk factors and obstetric characteristics associated with severe preeclampsia in the puerperal period. **Methods & Materials:** This prospective observational study included 50 women with severe preeclampsia who were enrolled consecutively at a tertiary care center in Bangladesh. Maternal sociodemographic characteristics, medical risk factors, obstetric history, pregnancy-related clinical features, maternal complications, delivery outcomes, and postpartum clinical status were assessed. Postpartum evaluation included blood pressure, antihypertensive treatment, renal function, proteinuria, and readmission. Factors associated with severe preeclampsia were evaluated using multivariable logistic regression. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated, and $p < 0.05$ was considered statistically significant. **Result:** The mean maternal age was 24.1 ± 3.5 years, and 70.0% were aged 18–24 years. Family history of hypertension/preeclampsia (24.0%), BMI $> 30 \text{ kg/m}^2$ (22.0%), and chronic hypertension (18.0%) were the most frequent maternal risk factors. Early-onset severe preeclampsia occurred in 38.0%, while 54.0% delivered preterm and 62.0% underwent cesarean delivery. Severe headache (78.0%), epigastric/right upper quadrant pain (72.0%), and visual disturbance (62.0%) were common clinical features. Persistent hypertension at discharge occurred in 96.0%, and proteinuria remained positive in 72.0% at 12 weeks. Chronic hypertension, previous preeclampsia, family history, BMI $> 30 \text{ kg/m}^2$, early-onset disease, epigastric/right upper quadrant pain, thrombocytopenia, and acute renal failure were independently associated with severe disease ($p < 0.05$). **Conclusion:** Severe preeclampsia was associated with substantial maternal morbidity, preterm delivery, and persistent postpartum hypertension. Identification of high-risk characteristics and continued postpartum surveillance are important for maternal care.

Keywords: Severe preeclampsia, puerperal period, maternal risk factors, obstetric characteristics, postpartum hypertension

(The Insight 2026; 9(3): 839-846)

1. Assistant professor (Gynae & Obs) in situ UHC khetlal, Joupurhat, Bangladesh (ORCID: 0009-0001-9565-0289)
2. Assistant Professor (Obs and Gayne) in situ, 400 Bed General Hospital Joypurhat, Bangladesh
3. Assistant Professor, 400 Bedded General Hospital Joypurhat, Bangladesh

INTRODUCTION

Preeclampsia is a pregnancy-specific hypertensive disorder characterized by new-onset hypertension after 20 weeks of gestation accompanied by proteinuria and/or maternal organ dysfunction. Preeclampsia with severe features is characterized by severe-range blood pressure or significant renal, hepatic, hematologic, neurologic, or pulmonary involvement [1,2]. Globally, preeclampsia complicates approximately 2–8% of pregnancies and remains an important cause of maternal and perinatal morbidity and mortality [2]. The condition represents a major clinical challenge because its severity ranges from hypertension without significant organ involvement to multisystem maternal complications and adverse perinatal outcomes. Severe forms require close clinical assessment because rapid progression can occur during pregnancy and after delivery. The pathogenesis of preeclampsia is multifactorial and is commonly initiated by abnormal placentation and inadequate

remodeling of the maternal spiral arteries. Consequently, uteroplacental blood flow becomes impaired, leading to placental ischemia and hypoxia. The stressed placenta releases antiangiogenic mediators, particularly soluble fms-like tyrosine kinase-1 (sFlt-1) and soluble endoglin (sEng), which interfere with proangiogenic signaling. This imbalance promotes widespread maternal endothelial dysfunction, vasoconstriction, inflammation, and activation of coagulation pathways, ultimately producing the clinical manifestations of preeclampsia [3–5]. The resulting systemic vascular dysfunction affects multiple maternal organ systems and contributes to the development of severe clinical manifestations. Severe preeclampsia is associated with serious maternal complications, including eclampsia, stroke, pulmonary edema, acute kidney injury, hepatic dysfunction, HELLP syndrome, placental abruption, and maternal death [1,6]. Placental insufficiency and medically indicated preterm delivery contribute to fetal growth restriction, prematurity, stillbirth,

and neonatal morbidity [3]. Importantly, hypertensive disease can persist or first become clinically apparent after delivery. Postpartum preeclampsia refers to new-onset hypertension developing 48 hours to 6 weeks after childbirth and can present with severe features. Despite its potential for serious maternal complications, postpartum preeclampsia remains relatively understudied [1,7,8]. Delayed postpartum presentation also creates difficulties in recognition because women are often discharged from hospital before the onset of clinically significant hypertension. The postpartum period therefore represents an important phase in the clinical course of hypertensive disorders of pregnancy. Although maternal and obstetric risk factors for preeclampsia are well established, their association with severe preeclampsia during the puerperal period remains insufficiently characterized [9]. Maternal characteristics such as older age, obesity, and gestational diabetes have been associated with late postpartum preeclampsia. Obstetric characteristics, including antenatal hypertensive disease and cesarean delivery, have also been reported in association with its development [10,11]. The existing evidence is predominantly derived from retrospective, single-center studies and investigations involving relatively small study populations, limiting the generalizability of available findings [3,10]. Evidence specifically addressing severe puerperal preeclampsia in Bangladesh remains limited. A better understanding of the maternal and obstetric characteristics associated with this condition is important for defining the clinical profile of affected women and identifying characteristics linked to severe disease. Therefore, the present study aimed to assess maternal risk factors and obstetric characteristics associated with severe preeclampsia in the puerperal period.

METHODS & MATERIALS

A hospital-based cross-sectional study was conducted among 50 women who had a history of antenatal severe preeclampsia and attended the Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahabagh, Dhaka for regular follow-up from April 2018 to September 2018. Patients were selected by purposive sampling technique. The total follow-up period was 42 days, at two separate settings.

Inclusion Criteria

- Women aged ≥ 18 years with a diagnosis of severe preeclampsia.
- Women who developed or presented with severe preeclampsia during pregnancy or the puerperal period.
- Women with adequate maternal, clinical, obstetric, and laboratory information.
- Women who provided written informed consent to participate.

Exclusion Criteria

- Women aged < 18 years.
- Women without a confirmed diagnosis of severe preeclampsia.
- Women with substantially incomplete clinical or obstetric records.
- Women unwilling to provide informed consent.

Ethical Considerations

The study protocol was reviewed and approved by the appropriate institutional ethics committee before

commencement. Written informed consent was obtained from all participants. Participation was voluntary, and participants were informed of their right to withdraw from the study at any stage without affecting their medical care. Personal identifiers were excluded from the analytical dataset, and confidentiality of all collected information was maintained throughout the study.

Data Collection

Data were collected using a structured interviewer-administered questionnaire and supplemented by clinical records, obstetric histories, examination findings, and laboratory reports. Sociodemographic variables included age, residence, educational level, occupation, and socioeconomic status. Maternal risk factors included chronic hypertension, previous preeclampsia, diabetes mellitus, chronic hypothyroidism, chronic kidney disease, BMI > 30 kg/m², in vitro fertilization, family history of hypertension/preeclampsia, and cardiovascular disease. Obstetric characteristics included gravidity, parity, history of abortion, previous cesarean delivery, previous preterm birth, and interpregnancy interval.

Pregnancy-related variables included gestational hypertension, gestational hypothyroidism, gestational diabetes mellitus, early-onset severe preeclampsia, puerperal presentation, magnesium sulfate and antenatal corticosteroid use, gestational age at diagnosis and delivery, and blood pressure at admission. Delivery-related variables included mode of delivery, gestational status at delivery, induction of labor, indication for cesarean section, and estimated blood loss.

Assessment of Severe Preeclampsia and Maternal Outcomes

Severe preeclampsia was assessed according to predefined clinical criteria, incorporating severe blood pressure elevation and associated severe clinical features or maternal organ involvement. Severe clinical manifestations included severe headache, visual disturbance, epigastric/right upper-quadrant pain, and neurological symptoms. Maternal complications assessed included acute renal failure, thrombocytopenia, HELLP syndrome, oliguria, eclampsia, acute pulmonary edema, placental abruption, and requirement for packed red-cell transfusion.

Postpartum outcomes included blood pressure status at discharge, number and duration of antihypertensive treatment, renal function at discharge, proteinuria at 6 and 12 weeks, blood pressure at 6-week postpartum follow-up, and readmission after delivery.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were summarized as frequencies and percentages. Associations between maternal or obstetric characteristics and severe preeclampsia-related outcomes were assessed using the chi-square test or Fisher's exact test where appropriate. Logistic regression analysis was performed to estimate adjusted odds ratios (aORs) with 95% confidence intervals for factors associated with severe preeclampsia in the puerperal period. A two-sided p-value < 0.05 was considered statistically significant.

RESULTS

The mean maternal age was 24.1 ± 3.5 years; 70.0% were aged 18–24 years. Most participants were urban residents (68.0%), had primary-level education (48.0%), were housewives

(84.0%), and belonged to the poor socioeconomic class (54.0%) (*Table I*).

Table I: Sociodemographic characteristics of the study participants (n=50)

Variables	Frequency (n)	Percentage (%)
Age (years)		
18–24	35	70.0
25–30	12	24.0
31–35	3	6.0
Mean $\pm$ SD	24.1 ± 3.5	
Residence		
Urban	34	68.0
Rural	16	32.0
Educational level		
Primary	24	48.0
Secondary	14	28.0
Higher than secondary	9	18.0
Illiterate	3	6.0
Occupation		
Not employed outside home/Housewife	42	84.0
Self-employed	7	14.0
Employed	1	2.0
Socioeconomic status		
Poor class	27	54.0
Middle class	15	30.0
High-income class	8	16.0

Family history of hypertension/preeclampsia was the most frequent maternal risk factor (24.0%), followed by BMI >30 kg/m² (22.0%) and chronic hypertension (18.0%). Previous preeclampsia and chronic hypothyroidism were each reported

in 10.0%, while chronic kidney disease, in vitro fertilization, and cardiovascular disease were present in 8.0%, 12.0%, and 4.0%, respectively (*Table II*).

Table II: Distribution of maternal risk factors among the study participants (n=50)

Maternal risk factor	Frequency (n)	Percentage (%)
Chronic hypertension	9	18.0
Previous preeclampsia	5	10.0
Diabetes mellitus	1	2.0
Chronic hypothyroidism	5	10.0
Chronic kidney disease	4	8.0
BMI >30 kg/m ²	11	22.0
In vitro fertilization	6	12.0
Family history of hypertension/preeclampsia	12	24.0
History of cardiovascular disease	2	4.0

Gravida 2 was the most frequent obstetric category (32.0%), and 74.0% of participants were multiparous. Previous cesarean delivery, abortion, and preterm birth were reported

in 30.0%, 12.0%, and 10.0%, respectively. An interpregnancy interval of 2–4 years was most common (32.0%) (*Table III*).

Table III: Obstetric history of the study participants (n=50)

Variables	Frequency (n)	Percentage (%)
Gravidity		
Primigravida	11	22.0
Gravida 2	16	32.0
Gravida 3	14	28.0
Gravida ≥4	9	18.0
Parity		
Nullipara	13	26.0
Multipara	37	74.0
History of abortion		
Yes	6	12.0
No	44	88.0
Previous cesarean delivery		
Yes	15	30.0
No	35	70.0
Previous preterm birth		
Yes	5	10.0
No	45	90.0
Interpregnancy interval		
<2 years	12	24.0
2–4 years	16	32.0
>4 years	9	18.0
Not applicable (primigravida/nullipara)	13	26.0

Gestational hypertension was present in 26.0%, while gestational hypothyroidism and gestational diabetes mellitus occurred in 10.0% and 8.0%, respectively. Early-onset severe preeclampsia before 34 weeks occurred in 38.0%, and 22.0% presented during the puerperal period. Magnesium sulfate and antenatal corticosteroids were administered to 68.0%

and 44.0%, respectively. Mean gestational ages at diagnosis and delivery were 32.8±3.6 and 34.1±2.9 weeks, respectively. Mean admission systolic and diastolic blood pressures were 178.6±17.9 and 113.2±10.5 mmHg (*Table IV*).

Table IV: Pregnancy-related clinical and obstetric characteristics among the study participants (n=50)

Variables	Frequency (n)	Percentage (%)
Gestational hypertension	13	26.0
Gestational hypothyroidism	5	10.0
Gestational diabetes mellitus	4	8.0
Early-onset severe preeclampsia (<34 weeks)	19	38.0
Puerperal presentation of preeclampsia	11	22.0
Received magnesium sulfate	34	68.0
Received antenatal corticosteroid therapy	22	44.0
Gestational age at diagnosis (weeks)		
Mean ± SD		32.8 ± 3.6
Gestational age at delivery (weeks)		
Mean ± SD		34.1 ± 2.9
Systolic BP at admission (mmHg)		
Mean ± SD		178.6 ± 17.9
Diastolic BP at admission (mmHg)		
Mean ± SD		113.2 ± 10.5
Maximum systolic BP, mmHg		220
Maximum diastolic BP, mmHg		130

Severe headache was the most common clinical feature (78.0%), followed by epigastric/right upper quadrant pain (72.0%) and visual disturbance (62.0%). Acute renal failure was the most frequent maternal complication (22.0%),

followed by thrombocytopenia (14.0%) and HELLP syndrome (10.0%) (*Table V*).

Table V: Severe maternal clinical features and complications among the study participants (n=50)

Variables	Frequency (n)	Percentage (%)
Severe clinical features		
Severe headache	39	78.0
Visual disturbance	31	62.0
Epigastric/RUQ pain	36	72.0
Neurological symptoms	8	16.0
Maternal complications		
Acute renal failure	11	22.0
Thrombocytopenia (<100,000/ μ L)	7	14.0
HELLP syndrome	5	10.0
Oliguria	4	8.0
Eclampsia	2	4.0
Acute pulmonary edema	1	2.0
Placental abruption	1	2.0
Required packed red-cell transfusion	4	8.0

Cesarean delivery was performed in 62.0%, and 54.0% delivered before 37 weeks. Severe preeclampsia was the leading indication for cesarean section (48.4%), followed by

fetal distress (29.0%) and failed induction (16.1%). Mean estimated blood loss was 620 $\pm$ 240 mL (*Table VI*).

Table VI: Delivery-related obstetric characteristics of the study participants (n=50)

Variables	Frequency (n)	Percentage (%)
Mode of delivery		
Cesarean section	31	62.0
Spontaneous vaginal delivery	19	38.0
Gestational status at delivery		
Preterm (<37 weeks)	27	54.0
$\geq$ 37 weeks	23	46.0
Induction of labor		
Yes	20	40.0
No	30	60.0
Indication for cesarean section		
Severe preeclampsia	15	48.4
Fetal distress	9	29.0
Failed induction	5	16.1
Other	2	6.5
Estimated blood loss (mL)		
Mean $\pm$ SD	620 $\pm$ 240	

Persistent hypertension at discharge was observed in 96.0%; 46.0% required two antihypertensive drugs and 8.0% required three or more. Treatment continued beyond 12 weeks in 24.0%. Renal impairment persisted in 4.0%, while

proteinuria remained positive in 8.0% at 6 weeks and 72.0% at 12 weeks. At 6 weeks, BP was <140/90 mmHg in 86.0%, and 8.0% required readmission (*Table VII*).

Table VII: Postpartum clinical status among women with severe preeclampsia (n=50)

Variables	Frequency (n)	Percentage (%)
BP at discharge		
Hypertension persisting at discharge	48	96.0
Number of antihypertensive drugs at discharge		
None	2	4.0
One drug	21	42.0
Two drugs	23	46.0
Three or more drugs	4	8.0
Duration of antihypertensive treatment		
<6 weeks	20	40.0
6–12 weeks	18	36.0
>12 weeks	12	24.0
Renal function at discharge		
Normal renal function	48	96.0
Persistent renal impairment	2	4.0
Proteinuria at 6 weeks		
Positive	4	8.0
Negative	46	92.0
Proteinuria at 12 weeks		
Positive	36	72.0
Negative	14	28.0
BP at postpartum follow-up (6 weeks)		
<140/90 mmHg	43	86.0
≥140/90 mmHg	7	14.0
Readmission after delivery		
Yes	4	8.0
No	46	92.0

Multivariable analysis identified chronic hypertension, previous preeclampsia, family history of hypertension/preeclampsia, BMI >30 kg/m², early-onset severe preeclampsia, epigastric/right upper quadrant pain,

thrombocytopenia, and acute renal failure as significant factors associated with severe preeclampsia (p<0.05) (*Table VIII*).

Table VIII: Factors Associated with severe preeclampsia in the puerperal period (n=50)

Variables	Adjusted OR	95% CI	p-value
Maternal age ≥25 years	1.84	0.72–4.71	0.201
Rural residence	1.67	0.68–4.09	0.263
Chronic hypertension	3.42	1.18–9.91	0.023
Previous preeclampsia	2.91	1.01–8.38	0.048
Family history of hypertension/preeclampsia	2.37	1.02–5.51	0.045
BMI >30 kg/m ²	2.58	1.05–6.34	0.039
Gestational diabetes mellitus	1.76	0.48–6.45	0.392
Early-onset severe preeclampsia (<34 weeks)	2.74	1.16–6.49	0.021
Severe headache	1.93	0.78–4.78	0.155
Visual disturbance	2.16	0.89–5.25	0.089
Epigastric/RUQ pain	2.41	1.01–5.77	0.048
Thrombocytopenia	2.68	1.04–6.90	0.041
Acute renal failure	3.51	1.21–10.18	0.020

DISCUSSION

Preeclampsia is a multisystem hypertensive disorder of pregnancy in which vascular and endothelial abnormalities can produce neurological, renal, hepatic, and hematological complications extending beyond delivery [11,7]. This makes the postpartum period an important phase of maternal care, particularly among women with severe disease. The present findings indicate a substantial burden of persistent hypertension, maternal complications, preterm delivery, and continued treatment requirements after childbirth. The sociodemographic profile was characterized predominantly by younger women, with most participants aged below 25 years. Urban residence, lower educational attainment, and lower socioeconomic status were also common. The relatively young age distribution differs from reports identifying

advanced maternal age as a risk factor for preeclampsia, particularly late postpartum disease [10]. This difference may reflect variation in study populations, disease definitions, and timing of presentation. Several established maternal risk factors were prominent, particularly chronic hypertension, obesity, previous preeclampsia, and family history of hypertension or preeclampsia. Chronic hypertension, previous preeclampsia, family history, and BMI >30 kg/m² were independently associated with greater disease severity in the adjusted analysis. These findings are consistent with evidence identifying previous preeclampsia, chronic hypertension, and obesity among the strongest clinical risk factors for preeclampsia [12,13]. Bartsch et al. reported strong associations for previous preeclampsia and chronic hypertension, while Duckitt and Harrington identified family history and elevated

BMI as important risk factors [12,13]. The consistency of these findings supports their relevance in women presenting with severe disease. Early-onset severe preeclampsia was another important finding and remained independently associated with the outcome after adjustment. Early-onset disease is generally associated with a more pronounced placental and maternal vascular phenotype and has been linked to subsequent cardiovascular and hypertensive morbidity [14]. Women with preeclampsia also remain at increased risk of chronic hypertension after pregnancy, with disease characteristics influencing this long-term risk [14]. In addition, preeclampsia has been associated with subsequent kidney disease, particularly among women with more severe or early-onset disease [22]. These observations emphasize the importance of gestational age at disease onset when assessing both immediate and longer-term maternal health burden. The clinical presentation reflected the multisystem nature of severe preeclampsia. Severe headache, epigastric or right upper quadrant pain, and visual disturbance were frequent manifestations, while acute renal failure, thrombocytopenia, HELLP syndrome, oliguria, and eclampsia represented important complications. Epigastric/right upper quadrant pain, thrombocytopenia, and acute renal failure remained independently associated with severe disease. These findings are consistent with the systemic involvement of preeclampsia, in which endothelial dysfunction and microvascular injury affect the central nervous system, liver, kidneys, and hematological system [11,15]. Renal involvement is particularly important because acute kidney injury during pregnancy-associated hypertensive disorders can contribute to persistent renal dysfunction and future cardiovascular risk [16,22]. The coexistence of neurological, hepatic, renal, and hematological abnormalities therefore indicates substantial maternal disease burden rather than isolated blood-pressure elevation. The obstetric outcomes further reflected the severity of maternal disease. More than half of the women delivered preterm, and cesarean delivery was more frequent than vaginal delivery. Severe preeclampsia and fetal distress were the leading indications for cesarean delivery, while failed induction accounted for a smaller proportion. The high frequency of preterm birth is clinically expected because severe maternal hypertension, organ dysfunction, or fetal compromise can necessitate delivery before term [17]. Cesarean delivery may similarly reflect the need for expedited delivery when maternal or fetal conditions preclude safe continuation of pregnancy. These findings demonstrate the substantial maternal and fetal consequences associated with severe hypertensive disease. The postpartum findings were particularly noteworthy. Hypertension persisted at discharge in nearly all women, and most required antihypertensive medication. A proportion continued treatment beyond 12 weeks, while renal impairment persisted in a smaller subset. Persistent postpartum hypertension can represent continuation of antenatal hypertensive disease and requires distinction from de novo postpartum preeclampsia and other secondary causes [7,18]. Hauspurg and Jeyabalan described postpartum preeclampsia as a condition that can develop after delivery and present with severe features requiring timely recognition and management [7]. Sibai similarly emphasized continued monitoring because serious hypertensive complications can occur during the postpartum period [18]. The persistence of proteinuria and hypertension after discharge further indicates that recovery from severe preeclampsia is not necessarily immediate. Although most women achieved blood-pressure control by 6 weeks, a smaller group remained hypertensive and some required readmission.

Guidelines recommend early postpartum blood-pressure assessment after hypertensive pregnancy, particularly among women with severe hypertension [19,23]. Continued follow-up is also important because hypertensive disorders of pregnancy are associated with increased long-term cardiometabolic risk [19,20]. Postpartum assessment should therefore extend beyond a single routine visit and include blood pressure, renal recovery, medication requirements, and recurrent symptoms. Such surveillance is particularly relevant for women with persistent hypertension or evidence of organ involvement. Overall, severe preeclampsia in this study was associated with substantial maternal systemic involvement, frequent preterm delivery, high cesarean utilization, and persistent postpartum hypertension. Chronic hypertension, previous preeclampsia, family history, obesity, early-onset disease, epigastric/right upper quadrant pain, thrombocytopenia, and acute renal failure emerged as important factors associated with greater disease burden. The persistence of hypertension and renal abnormalities after delivery reinforces the importance of structured postpartum surveillance and longer-term cardiovascular and renal follow-up in women affected by severe preeclampsia [14,19–23].

LIMITATIONS

This study had several limitations. The relatively small sample size and single-center, hospital-based design may limit the generalizability of the findings to the wider population. The short follow-up period restricted assessment of long-term maternal cardiovascular and renal outcomes following severe preeclampsia. In addition, reliance on routinely recorded clinical and laboratory data may have introduced information bias. Larger multicenter studies with longer follow-up are needed to provide more representative evidence.

CONCLUSION & RECOMMENDATIONS

Severe preeclampsia in the puerperal period represents a substantial maternal health burden, characterized by multisystem complications, preterm delivery, and persistent postpartum hypertension. The present findings identified chronic hypertension, previous preeclampsia, family history of hypertension/preeclampsia, obesity, early-onset disease, epigastric/right upper quadrant pain, thrombocytopenia, and acute renal failure as important factors associated with severe disease. Persistent hypertension and proteinuria after delivery further emphasize the need for continued maternal surveillance. Early recognition of high-risk characteristics and structured postpartum follow-up may facilitate timely management and reduce maternal morbidity. Further multicenter studies with larger populations and longer follow-up are warranted.

FUNDING

No funding sources

CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Espinoza J, Vidaeff A, Pettker CM, Simhan H. Gestational hypertension and preeclampsia. *Obstetrics and gynecology*. 2020 Jun 1;135(6):E237-60.
2. Ives CW, Sinkey R, Rajapreyar I, Tita AT, Oparil S. Preeclampsia—pathophysiology and clinical presentations: JACC state-of-the-art

- review. *Journal of the American College of Cardiology*. 2020 Oct 6;76(14):1690-702.
3. Rana S, Lemoine E, Granger JP, Karumanchi SA. Preeclampsia: pathophysiology, challenges, and perspectives. *Circulation research*. 2019 Mar 29;124(7):1094-112.
4. Ngene NC, Moodley J. Role of angiogenic factors in the pathogenesis and management of pre-eclampsia. *International Journal of Gynecology & Obstetrics*. 2018 Apr;141(1):5-13.
5. Tomimatsu T, Mimura K, Matsuzaki S, Endo M, Kumasawa K, Kimura T. Preeclampsia: maternal systemic vascular disorder caused by generalized endothelial dysfunction due to placental antiangiogenic factors. *International journal of molecular sciences*. 2019 Aug 30;20(17):4246.
6. Pankiewicz K, Szczerba E, Maciejewski T, Fijałkowska A. Non-obstetric complications in preeclampsia. *Menopause Review/Przegląd Menopauzalny*. 2019 Jun 14;18(2):99-109.
7. Hauspurg A, Jeyabalan A. Postpartum preeclampsia or eclampsia: defining its place and management among the hypertensive disorders of pregnancy. *American journal of obstetrics and gynecology*. 2022 Feb 1;226(2):S1211-21.
8. Hacker FM, Jeyabalan A, Quinn B, Hauspurg A. Implementation of a universal postpartum blood pressure monitoring program: feasibility and outcomes. *American journal of obstetrics & gynecology MFM*. 2022 May 1;4(3):100613.
9. Vaillant-Roussel H, Cadwallader JS, Gelly J. Detect women with pre-eclampsia. *EXERCER-LA REVUE FRANCOPHONE DE MEDECINE GENERALE*. 2016 Nov 1;27(128):288-.
10. Bigelow CA, Pereira GA, Warmesley A, Cohen J, Getrajdman C, Moshier E, Paris J, Bianco A, Factor SH, Stone J. Risk factors for new-onset late postpartum preeclampsia in women without a history of preeclampsia. *American journal of obstetrics and gynecology*. 2014 Apr 1;210(4):338-e1.
11. Sibai BM, Stella CL. Diagnosis and management of atypical preeclampsia-eclampsia. *American journal of obstetrics and gynecology*. 2009 May 1;200(5):481-e1.
12. Bartsch E, Medcalf KE, Park AL, Ray JG. Clinical risk factors for pre-eclampsia determined in early pregnancy: systematic review and meta-analysis of large cohort studies. *Bmj*. 2016 Apr 19;353.
13. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. *Bmj*. 2005 Mar 12;330(7491):565.
14. Voskamp LW, Rousian M, Koerts JJ, Steegers-Theunissen RP, Danser AJ, Verdonk K. Risk factors for chronic hypertension 5 years after a pregnancy complicated by preeclampsia: a systematic review and meta-analysis. *Journal of Hypertension*. 2025 Feb 27;43(6):939.
15. Sibai BM. Diagnosis, prevention, and management of eclampsia. *Obstetrics & Gynecology*. 2005 Feb 1;105(2):402-10.
16. Kattah AG, Garovic VD. The management of hypertension in pregnancy. *Advances in chronic kidney disease*. 2013 May 1;20(3):229-39.
17. Lari NF, DeBaun MR, Oppong SA. The emerging challenge of optimal blood pressure management and hypertensive syndromes in pregnant women with sickle cell disease: a review. *Expert Review of Hematology*. 2017 Nov 2;10(11):987-94.
18. Sibai BM. Etiology and management of postpartum hypertension-preeclampsia. *American journal of obstetrics and gynecology*. 2012 Jun 1;206(6):470-5.
19. Lowe NK. Reconsidering postpartum care. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2019 Jan 1;48(1):1-2.
20. Pankiewicz K, Szczerba E, Maciejewski T, Fijałkowska A. Non-obstetric complications in preeclampsia. *Menopause Review/Przegląd Menopauzalny*. 2019 Jun 14;18(2):99-109.
21. Williams D. Long-term complications of preeclampsia. In *Seminars in nephrology* 2011 Jan 1 (Vol. 31, No. 1, pp. 111-122). WB Saunders.
22. Kristensen JH, Basit S, Wohlfahrt J, Damholt MB, Boyd HA. Pre-eclampsia and risk of later kidney disease: nationwide cohort study. *Bmj*. 2019 Apr 29;365.
23. Webster K, Fishburn S, Maresh M, Findlay SC, Chappell LC. Diagnosis and management of hypertension in pregnancy: summary of updated NICE guidance. *Bmj*. 2019 Sep 9;366.