

Clinical and Biochemical Parameters of Severe Preeclampsia in Puerperium

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ABSTRACT

Background: Preeclampsia is a multisystem disorder that may cause persistent hypertension, proteinuria, and other clinical and biochemical abnormalities beyond delivery. Continued postpartum monitoring is therefore important for early detection and management of persistent abnormalities. **Aim of the study:** To observe the changes in clinical and biochemical parameters among women with severe preeclampsia during puerperium. **Methods & Materials:** A hospital-based cross-sectional study was conducted among 50 women with antenatal severe preeclampsia attending the Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from April 2018 to September 2018. Participants were selected by purposive sampling and followed for 42 days at two separate settings. Data were collected using a structured data collection sheet through interview, clinical examination, haematological and biochemical investigations, and 24-hour urine protein assessment. Data were analyzed using SPSS, with frequency, percentage, mean $\pm$ SD, and Chi-square test; $p < 0.05$ was considered statistically significant. **Result:** The mean age of the participants was 24.1 ± 3.5 years, with 70.0% aged 18–24 years, while 68.0% were from urban areas and 62.0% were primiparous. During the antenatal period, all participants had high blood pressure and proteinuria, while severe headache (78.0%), nausea or vomiting (84.0%), and epigastric pain (72.0%) were common manifestations. Thrombocytopenia was present in 76.0%, elevated SGOT in 74.0%, elevated LDH in 84.0%, and elevated serum uric acid in 62.0%. At the 5th day of puerperium, hypertension persisted in all participants and proteinuria was present in 64.0%. At the 6th week, hypertension persisted in 14.0% and proteinuria in 8.0%, while headache, sleep disturbance, and blurred vision/light sensitivity persisted in 12.0%, 12.0%, and 14.0%, respectively. Overall, 8.0% participants demonstrated persistent severe preeclampsia at the 6th week, whereas 92.0% achieved complete recovery. **Conclusion:** Persistent clinical and biochemical abnormalities may remain after delivery among women with severe preeclampsia. Continued postpartum follow-up and timely management may help reduce maternal complications.

Keywords: Preeclampsia; Puerperium; Postpartum hypertension; Proteinuria; Biochemical parameters.

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INTRODUCTION

Persistent hypertension, proteinuria, and other clinical, biochemical manifestation of preeclampsia during puerperium increased the morbidity, disability and impaired the quality of life of the patients. Preeclampsia is a systemic syndrome that occurs in 3 to 5% of pregnant women and classically manifests as new-onset hypertension and proteinuria after 20 weeks of gestation. Placental antiangiogenic factors are upregulated and disrupt the maternal endothelium. This change in the normal angiogenic balance toward an antiangiogenic state can result in hypertension, proteinuria, glomerular endotheliosis, HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome, and cerebral edema - the clinical signs of preeclampsia and eclampsia [1]. Proteinuria and hypertension dominate the clinical picture, because the chief target organ is the kidney (glomerular endotheliosis) [2]. After delivery, hypertension, proteinuria, renal failure and others complications are expected to resolve progressively. It is believed that the initiating event in PE is reduced placental perfusion, which develops from shallow cytotrophoblast migration toward the uterine spiral arterioles which leads to

inappropriate vascular remodeling and a hypoperfused placenta [3-5]. Preeclampsia is a two-stage disease [6]. This in turn leads to the second, symptomatic stage, wherein the pregnant woman develops characteristic hypertension, renal impairment, and proteinuria and is at risk for the HELLP syndrome, eclampsia, and other end-organ damage [7]. Feedback mechanism relapses the condition in physiological state during Puerperium. Age related systemic vascular stiffness, immunosuppressive condition, nutritional deficiency, dysregulation of metabolic factors are responsible for persistence of clinical and biochemical parameters of severe preeclampsia during puerperium. On the basis of the observation that the only definitive cure for preeclampsia is delivery of the placenta [8,9] and that women who experience a molar pregnancy, in which a placenta develops without a fetus, frequently develop severe preeclampsia. Pathologic examination of placentas from preeclamptic pregnancies generally reveals placental infarcts and sclerotic narrowing of arteries and arterioles, with characteristic diminished endovascular invasion by cytotrophoblasts and inadequate remodeling of the uterine spiral arterioles [10]. All of the clinical manifestations of preeclampsia can be

attributed to glomerular endotheliosis, increased vascular permeability, and a systemic inflammatory response that results in end-organ damage and/or hypoperfusion [11]. In severe condition, hypertension and proteinuria may persist beyond the puerperium for long time. Hypertension and proteinuria usually resolve during the first week of postpartum in most women, but may persist for long time. All these factors promote persistence of hypertension and proteinuria beyond the post-partum period. In addition, the available data in the medical literature have primarily focused on antenatal and peripartum management of such patients, even though patients persisting preeclampsia after delivery in postpartum period are not focused. Therefore, this study will focus on the prevalence, etiology, and evaluation and management of women who have de novo or persistent postpartum hypertension. The aim of this study was to observe the changes of clinical and biochemical parameters in case of severe preeclampsia in Puerperium.

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), Shahbagh, 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 who had antenatal severe preeclampsia.
- Women who attended the department for regular follow-up.
- Women who provided informed consent for inclusion in the study.

Exclusion Criteria

- Women who developed de novo preeclampsia during puerperium.
- Seriously ill patients.

Ethical Considerations

Each patient was given a special ID number to maintain confidentiality. Written informed consent was obtained from each participant. Permission was obtained from the department, and the study followed the Helsinki Declaration for Medical Research involving Human Subjects 1964. Only research personnel had access to the data.

Data Collection

Data were collected using a pre-designed structured data collection sheet.

Sociodemographic information included age, residence, occupation, and socioeconomic status. Anthropometric information included BMI. Obstetric information included gestational age, parity, gravidity, and history of preeclampsia. Clinical and laboratory information included blood pressure, clinical improvement following delivery, proteinuria, serum bilirubin, SGPT, serum creatinine, CBC, and urine R/M/E.

The purpose and procedure of the study were discussed with the patients, and written informed consent was obtained. Data were collected through interview, observation, clinical examination, haematological and biochemical investigations, and from the history sheet of the patients. Blood pressure was measured with the woman at rest and the arm held at the level of the heart. Blood samples were collected from the antecubital vein; 10 ml blood was drawn into a heparinized syringe, centrifuged for 10 minutes at 3000 rpm, and sent for testing.

Proteinuria was measured by 24-hour urine collection. Urine was collected in three separate, clearly marked containers over 24 hours. The total specimen volume was calculated from all three containers, and aliquots were obtained for analysis. Protein analysis was performed using the modified Fujita method. Proteinuria was categorized as no proteinuria <300 mg, mild

proteinuria >300 to <2000 mg, and severe proteinuria >2000 mg.

Statistical Analysis

Data were analyzed using Statistical Program for Social Science (SPSS Inc 26.0., Chicago, IL, USA). Categorical variables were expressed as frequency and percentage, while continuous variables were expressed as mean ± SD. The unpaired t-test was used for continuous variables, and the Chi-square test was used for categorical variables. A p-value <0.05 was considered statistically significant.

RESULT

The mean age of the participants was 24.1±3.5 years, with 70.0% aged 18–24 years, 24.0% aged 25–30 years, and 6.0% aged 31–35 years. Most participants were from urban areas (68.0%), while 32.0% were from rural areas. Regarding educational status, 48.0% had primary education, 28.0% had secondary education, 18.0% had education higher than secondary level, and 6.0% were illiterate. More than half of the participants belonged to the poor socioeconomic class (54.0%), followed by the middle class (30.0%) and high-income class (16.0%). Primiparous women accounted for 62.0% of the study population, whereas 38.0% were multiparous (*Table I*).

Table I
Sociodemographic and Obstetric 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 ± SD	24.1 ± 3.5	
Residence		
Urban	34	68.0
Rural	16	32.0
Educational Status		
Primary	24	48.0
Secondary	14	28.0
Higher than Secondary	9	18.0
Illiterate	3	6.0
Socioeconomic Status		
Poor Class	27	54.0
Middle Class	15	30.0
High Income Class	8	16.0
Parity		
Primiparous	31	62.0
Multiparous	19	38.0

During the antenatal period, hypertension (≥140/90 mmHg) and proteinuria were present in 100.0% of participants. Common clinical manifestations included nausea or vomiting (84.0%), severe headache

(78.0%), sleep disturbance (76.0%), epigastric pain (72.0%), blurred vision/light sensitivity (62.0%), decreased urine output (62.0%), and respiratory distress (54.0%). Basal crepitation was

observed in 36.0% of participants (*Table II*).

Table IIClinical Manifestations of Severe Preeclampsia During Antenatal Period ($n=50$).

Variables	Frequency (n)	Percentage (%)
High blood pressure ($\geq 140/90$ mm Hg)	50	100.0
Proteinuria	50	100.0
Severe headaches	39	78.0
Sleep disturbance	38	76.0
Epigastric pain	36	72.0
Blurred vision/light sensitivity	31	62.0
Decreased urine output	31	62.0
Respiratory distress	27	54.0
Basal crepitation	18	36.0
Nausea or vomiting	42	84.0

The baseline laboratory profile showed thrombocytopenia ($<100,000/\text{mm}^3$) in 76.0% of participants, while 24.0% had platelet counts $>100,000/\text{mm}^3$. Serum

creatinine was <1.1 mg/dL in 86.0% and >1.1 mg/dL in 14.0%. Elevated SGOT (>70 IU/L), LDH (>600 IU/L), serum bilirubin (>1.2 mg/dL), and serum uric acid

(>4.5 mg/dL) were present in 74.0%, 84.0%, 52.0%, and 62.0%, respectively (Table III).

Table IIIBaseline Hematological and Biochemical Profile During Antenatal Period ($n=50$).

Laboratory Parameters	Frequency (n)	Percentage (%)
Thrombocyte count		
$<100,000/\text{mm}^3$	38	76.0
$>100,000/\text{mm}^3$	12	24.0
Serum creatinine		
<1.1 mg/dL	43	86.0
>1.1 mg/dL	7	14.0
Liver enzyme		
SGOT >70 IU/L	37	74.0
LDH >600 IU/L	42	84.0
Serum bilirubin >1.2 mg/dL	26	52.0
Serum uric acid >4.5 mg/dL	31	62.0

The mean 24-hour proteinuria during the antenatal period was 3.17 ± 1.5 g, ranging from 0.6–4.1 g, while mean systolic and

diastolic blood pressures were 182.3 ± 18.4 mmHg and 114.3 ± 10.7 mmHg, respectively (Table IV).

Table IVAntenatal Blood Pressure and Proteinuria Profile of study populations ($n=50$).

Variables	Frequency	Percentage (%)
Proteinuria (gm/24 hrs)		
0.3-0.9	9	18.0
1.0-2.9	23	46.0
>3.0	18	36.0
Range (min-max)	0.6-4.1	
Mean $\pm$ SD	3.17 ± 1.5	
Systolic BP (mmHg)		
Mean $\pm$ SD	182.3 ± 18.4	
Range (min-max)	$^{\wedge}160-220$	
Diastolic BP (mmHg)		
Mean $\pm$ SD	114.3 ± 10.7	
Range (min-max)	$^{\wedge}110-130$	

At the 5th day of puerperium, high blood pressure persisted in 100.0% and proteinuria in 64.0% of participants. Headache, sleep disturbance, and blurred vision/light sensitivity were present in

70.0%, 46.0%, and 36.0%, respectively. By the 6th week, the corresponding proportions had declined to 14.0% for hypertension, 8.0% for proteinuria, 12.0% for headache, 12.0% for sleep disturbance,

and 14.0% for blurred vision/light sensitivity (Table V).

Table V
Persistence of Clinical Manifestations During Puerperium (n=50).

Variables	5th Day		6th Week	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
High blood pressure (>140/90 mm Hg)	50	100.0	7	14.0
Proteinuria	32	64.0	4	8.0
Headaches	35	70.0	6	12.0
Epigastric pain	8	16.0	0	0.0
Sleep disturbance	23	46.0	6	12.0
Blurred vision/light sensitivity	18	36.0	7	14.0
Nausea or vomiting	11	22.0	0	0.0
Decreased urine output	0	0.0	0	0.0
Respiratory distress	3	6.0	0	0.0
Basal crepitation	0	0.0	0	0.0

Hematological and biochemical abnormalities also improved over follow-up, with thrombocytopenia declining from 76.0% antenatally to 28.0% at day 5 and 0% at week 6. Elevated SGOT declined from 74.0% to 44.0% and 0%, while elevated LDH declined from 84.0% to 76.0% and 12.0%, respectively (Table VI).

Table VI
Changes in Hematological and Biochemical Parameters During Follow-up (Antenatal, 5th Day and 6th Week).

Laboratory Parameters	Antenatal		5th Day		6th Week	
	n	%	n	%	n	%
Platelet count <100,000/mm ³	38	76.0	14	28.0	0	0.0
Platelet count >100,000/mm ³	12	24.0	36	72.0	50	100.0
Serum creatinine <1.1 mg/dL	43	86.0	19	38.0	8	16.0
Serum creatinine >1.1 mg/dL	7	14.0	31	62.0	42	84.0
SGOT >70 IU/L	37	74.0	22	44.0	0	0.0
LDH >600 IU/L	42	84.0	38	76.0	6	12.0
Serum bilirubin >1.2 mg/dL	26	52.0	9	18.0	0	0.0
Serum uric acid >4.5 mg/dL	31	62.0	25	50.0	7	14.0

Table VII represents 94.0% of participants had undergone caesarean section, while 6.0% had vaginal delivery. At 6 weeks, 8.0% of participants had persistent severe preeclampsia, whereas 92.0% showed complete recovery.

Table VII
Overall Persistence of Severe Preeclampsia at 6 Weeks of Puerperium (n=50).

Variables	Frequency (n)	Percentage (%)
Mode of Delivery		
Vaginal delivery	3	6.0
Caesarean section	47	94
Overall Outcome at 6th Week		
Persistent severe preeclampsia	4	8.0
Complete recovery	46	92.0

DISCUSSION

Preeclampsia is a multisystem hypertensive disorder of pregnancy, and its clinical and biochemical manifestations may persist beyond delivery, making the puerperium a critical period for continued maternal surveillance and timely recognition of postpartum complications [12,13]. Majority of patients 70.0% belongs to age 18 to 24 yrs. Mean age of patients was 24.1±3.5 years. Large numbers of respondents came from urban area (68.0%), and socioeconomically poor class (54.0%) comprising the major percentage of the patients. In this study most of the women were primi (62.0%). Multiparity was 38.0% of women. In a study reported that age of less than 20 y, family h/o preeclampsia (OR=36.0), family h/o diabetes (OR=44.9), family h/o hypertension (OR=16.7) and previous h/o PIH (OR=58.5) are found to be significant risk factors of pre eclampsia [14]. Most

preeclampsia occurs in healthy nulliparous women, in whom the incidence of preeclampsia may be as high as 7.5%. Although preeclampsia is classically a disorder of women in their first pregnancy, multiparous pregnant women with a new partner have an elevated risk of preeclampsia similar to that of nulliparous women [15,16]. Preeclampsia (PE) is a multisystem disorder of unknown aetiology characterized by development of hypertension to the extent of 140/90 mm Hg or more with proteinuria after 20th week in a previously normotensive and nonproteinuric women. As per most accepted guide lines, severe preeclampsia is preeclampsia with severe hypertension and/or with symptoms and/or biochemical and/or heamatological impairment [17]. No single factor has been identified as the cause of preeclampsia; however, substantial evidence suggests that increased oxidative stress, the production of

vasoconstrictor agents, altered placental cytokine generation, and the formation of other toxic compounds by the placenta contribute to endothelial dysfunction in preeclampsia. While placental dysfunction may not be the sole cause of preeclampsia, it may trigger or significantly contribute to the vascular complications associated with the disorder [18]. In this study, high blood pressure (>140/90 mm Hg), proteinuria, sleep disturbance, epigastric pain and blurred vision or light sensitivity were most common symptoms, present in 100.0%, 100.0%, 76.0%, 72.0% & 62.0% patients respectively. Other common symptoms were decreased urine output (62.0%), headaches (78.0%), and respiratory distress (54.0%) of patients. On evaluation of laboratory parameter, thrombocytopenia (<100,000/mm³) had detected in 76.0%, progressive renal insufficiency (serum creatinine concentration greater than 1.1 mg/dL) in 86.0%, SGOT >70 IU/L in

74.0%, LDH >600 IU/L in 84.0% and Serum uric acid >4.5 mg/dL in 62.0%. Preeclampsia may be asymptomatic or may cause edema or excessive weight gain. Nondependent edema, such as facial or hand swelling, is more specific than dependent edema. Reflex reactivity may be increased, indicating neuromuscular irritability, which can progress to seizures (eclampsia). Petechiae and other signs of coagulopathy may also develop. Preeclampsia with severe features may cause organ damage; these features may include severe headache, visual disturbances, confusion, epigastric or right upper quadrant abdominal pain reflecting hepatic ischemia or capsular distention, nausea and/or vomiting, dyspnea, and oliguria [6,19]. In our study, routine monitoring and follow-up was conducted upto 6th week of puerperium. At first follow up (5th day of puerperium), gradually improvement was observed, but high blood pressure was persisted in all cases. Proteinuria had recorded in total 64.0%, Headaches in 70.0%, Sleep disturbance in 46.0%. At second follow up (6th week of puerperium) significant improvement occurs. But 14.0% was persisted hypertension, 12.0% noticed headaches, 12.0% had sleep disturbance & 8.0% had blurred vision or light sensitivity. On evaluation of laboratory parameters, thrombocytopenia was observed in 24.0% at 5th day of puerperium. But at the end of follow up none of the case detected thrombocytopenia. Progressive renal insufficiency was observed in 38.0% at 5th day of puerperium, but at 6th week of puerperium only 16.0% case detected renal insufficiency. At 6th week of puerperium liver function was progressively improve, only 12.0% was found LDH >600 IU/L. In clinical practice, most women will not have their blood pressure (BP) checked until the 6 weeks' postpartum visit in physician's offices or in postpartum clinics. As a result, women with mild hypertension who are asymptomatic are usually not reported. In addition, postpartum women who have hypertension in association with symptoms such as headaches or blurred vision are often seen and managed in the emergency department and will not be coded as hypertensive unless they are hospitalized [20,21]. Maternal hypertension and proteinuria will usually resolve during the first week postpartum in most women with GH or preeclampsia, however, there are conflicting data regarding the time it takes for resolution in such women. In women with preeclampsia, there is a decrease in BP within 48 hours, but BP increases again between 3-6 days postpartum [7,22]. Postpartum hypertension can be related to persistence of gestational hypertension, preeclampsia, or preexisting chronic hypertension, or it could develop de novo postpartum secondary to other causes.

Therefore, medical providers caring for postpartum women should be educated about continued monitoring of signs and symptoms and prompt management of these women in a timely fashion [23].

LIMITATIONS

This study has several limitations. Its single-center design in Dhaka may limit the generalizability of the findings to the wider population of Bangladesh. The relatively short study period may have restricted assessment of temporal variations. Furthermore, the small sample size may have limited statistical power. Future multicenter studies with larger sample sizes and longer follow-up periods are recommended to validate these findings.

CONCLUSION & RECOMMENDATIONS

Pre-eclampsia is a multisystem disorder that may cause persistent clinical and biochemical abnormalities beyond delivery. In this study, 8.0% patients demonstrated persistent features of pre-eclampsia at the sixth week of puerperium, highlighting the need for continued postpartum monitoring. Early detection and appropriate management of persistent abnormalities may reduce maternal complications. Future multicenter studies across different regions of Bangladesh, involving larger sample sizes and longer study periods, are recommended. Ensuring timely availability of relevant laboratory investigations and comprehensive treatment facilities may further improve the detection, monitoring, and management of persistent pre-eclampsia during the puerperium.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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