

# Maternal and Perinatal Outcomes in Women with Preeclampsia: A Case-Control Study in a Tertiary Care Hospital, Dhaka, Bangladesh

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## Abstract

**Introduction:** Preeclampsia is an advanced objection characterized by the new start of hypertension and proteinuria or the new start of hypertension and important end-organ dysfunction with or without proteinuria in the last half of the prenatal period or post-delivery. Long-term, patients with preeclampsia are at enhanced risk for developing cardiovascular and renal disease. The aim of the study was to evaluate the maternal and perinatal outcomes in women suffering from preeclampsia.

**Methods:** A case-control study was carried out in the Department of Obstetrics and Gynecology, Sir Salimullah Medical College Mitford Hospital, Dhaka from July 2020 to June 2021. A total number of one hundred twelve pregnant women (N=112), were enrolled in the study and fifty-six (n=56) were included as preeclampsia (Cases) and another fifty-six (n=56) were enrolled as normotensives (Controls). Data were collected using the predesigned semi-structured questionnaire. Verbal consent was taken before recruiting the study population. Completed data forms were reviewed, edited, and processed for computer data entry. The data analysis was performed using Statistical Package for the Social Sciences (SPSS) Version 25.0. **Result:** Respondents' mean age was  $27.35 \pm 4.85$  (case) &  $26.46 \pm 4.86$  (control) years. Maximum study subjects had only primary education. The majority of the respondents were homemakers in all groups. Respondents' mean gestational age was  $36.28 \pm 2.12$  (case) &  $36.57 \pm 1.82$  (control) weeks respectively and was significant in both case and control groups ( $p=.001$ ). There was no statistical difference according to gravida found between the cases and controls. Based on maternal outcomes, delivery by cesarean section was greater in cases than in controls ( $p<0.001$ ), & eclampsia ( $p<0.001$ ) and PPH ( $p=0.002$ ) were significantly lower in controls than cases. Based on the neonatal outcome, birth weight was significantly lower in cases than in controls ( $p=0.020$ ), and stillbirth was significantly lower in controls than cases ( $p=0.042$ ). **Conclusion:** Preeclampsia may be linked to complications with the placenta initially in the pregnancy. A very little amount of maternal complications and fetal complications rose in this current analysis and the result of the findings was satisfactory.

**Keywords:** Preeclampsia, Pregnancy, Placenta, Hypertension.

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## INTRODUCTION

Preeclampsia is a progressive complaint categorized by the new start of hypertension and proteinuria or the new start of hypertension and

significant end-organ dysfunction with or without proteinuria in the last half of the prenatal period or post-delivery [1]. The occurrence of preeclampsia differs considerably because of its extensive disparity in

epidemiological studies. In developing countries, it ranges from 1.8 to 16.7%. The World Health Organization (WHO) states that its incidence is seven times higher in developing countries (2.8% of live birth) than in developed countries (0.4%) [2]. The incidence of preeclampsia in Bangladesh is about 76,032 [3]. Nearly 90% of cases present in the late preterm, term or postpartum period and have better neonatal and maternal outcomes. However, the mother and the child are still at growing threat for severe morbidity and mortality and the remaining 10% of cases have a prior presentation, which is associated with a greater risk of maternal and fetal or newborn complications than preeclampsia at term and carries the extra high risks associated with moderately preterm, very preterm, or extremely preterm birth [4, 5]. Long-term patients with preeclampsia are at enhanced risk for developing the cardiovascular and renal disease [6]. The most frequent complications occurring in the progress of preeclampsia are preterm delivery, fetal growth restriction (FGR), intrauterine fetal death (IUFD) and Hemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome with a high risk of liver rupture and eclampsia [7]. The condition could lead to a separation of the placenta from the uterus, preterm birth, and stillbirth and in severe cases, preeclampsia can turn into eclampsia, which includes seizures [8]. Although the identification of the risk factors for preeclampsia is diverse some known risk factors are documented like nulliparity, family history, preeclampsia in a previous pregnancy, multiple gestations, and known cases of diabetes mellitus, chronic hypertension, chronic renal disease and some autoimmune diseases [9]. Women under 20 years of age, women with low levels of education, and women in their first pregnancy are all recounted to be at higher risk [10]. There are some possible measures in case of preventing preeclampsia. Primary prevention involves evading pregnancy in women at high risk for preeclampsia, adapting lifestyles or improving nutrient intake in the whole population to decrease the incidence of the disease. Secondary prevention is based on the intermission of known pathophysiological mechanisms of disease before its establishment. To avoid severe complications, effective intervention should be applied as early as possible. Tertiary prevention relies on using treatment to avoid preeclampsia complications, however, tertiary prevention can be arduous to achieve without exposing many to possibly avoidable risks [11, 12]. This current study intended to evaluate the maternal and perinatal outcomes in women suffering from preeclampsia.

### Objectives

- To assess the maternal and perinatal outcomes in women suffering from preeclampsia.

## METHODOLOGY

A case-control study was carried out in the Department of Obstetrics and Gynecology, Sir Salimullah Medical College Mitford Hospital, Dhaka

from July 2020 to June 2021. A total number of one hundred twelve pregnant women (N=112), were enrolled in the study and fifty-six (n=56) were included as preeclampsia (Cases) and another fifty-six (n=56) were enrolled as normotensives (Controls). A purposive sampling technique was followed. All observations were noted in the clinical data sheet. Informed written consent of the study subjects was taken in easily understandable Bengali phrases. The results were calculated and interpreted through appropriate statistical analysis with the help of a statistician and presented with a table with other illustrations. Ethical clearance was taken from the hospital. The information was kept confidential only to be used for the study purpose. As a baseline investigation, after 10 minutes of rest, BP was measured on both arms following the standard procedure. Korotkoff phase 1 (first beat heard) and phase 5 (disappearance of sound) was used to determine systolic (SBP) and diastolic blood pressure (DBP) with a sphygmomanometer. The BP was measured on the right arm with the patient sitting comfortably, legs uncrossed and back and arm supported or lying on her back 45 degrees to horizontal. In both cases, the occluded brachial artery was kept at the level of the heart. When BP was found elevated on the initial assessment, the measurement was repeated at least 4 to 6 hours apart to confirm hypertension. After all aseptic precautions, 5 ml of venous blood sample was collected from the median cubital vein in a disposable plastic syringe from each study subject. The needle was detached from the nozzle and transferred blood immediately into a dry, clean and plain test tube with a gentle push to avoid hemolysis. Then blood sample was allowed to clot at room temperature and then centrifuged at 3000 rpm for 20 minutes and the serum was separated for biochemical assay on the day of collection. The separated serum was collected in an Eppendorf tube labelled appropriately for biochemical assay. The human chorionic gonadotropin (hCG) is a glycoprotein composed of two noncovalently linked subunits,  $\alpha$  and  $\beta$ , and is produced by syncytiotrophoblast cells of the placenta. The total  $\beta$ -hCG estimation was carried out by Vitros5600 Immunoassay Analyzer using enhanced chemiluminescence technology and sandwich ELISA method. Each laboratory should determine its reference interval for the diagnostic evaluation of patient results.

### Data analysis

The study coordinators performed random checks to verify data collection processes. Completed data forms were reviewed, edited, and processed for computer data entry. Frequencies and percentages were used for descriptive analysis. The descriptive statistics of the study were presented in tables, figures or suitable graphs, frequency, percentage and mean  $\pm$  SD as per the requirement of qualitative and quantitative variables. For statistical analysis Unpaired t-test, Chi-Square Test, and Fisher's Exact Test was done to see the difference between case and control. The data analysis was performed using Statistical Package for the Social

Sciences (SPSS) Version 25.0. P values <0.05 was considered statistically significant.

#### Inclusion criteria

- Age 18 - 35 years.
- Women without preeclampsia (Normotensive healthy pregnant women)
- 34 – 40 Weeks of Pregnancy
- Singleton pregnancy.

#### Exclusion criteria

- Patients with multiple gestations
- Diagnosed case of gestational diabetes mellitus / Diabetes mellitus
- Pregnancy with chronic hypertension, chronic renal disease & autoimmune disease
- Previous history of preeclampsia

## RESULTS

Among one hundred twelve pregnant women (N=112), fifty-six (n=56) were enrolled as preeclampsia (Cases) and another fifty-six (n=56) were enrolled as normotensives (Controls). Respondents' mean age was  $27.35 \pm 4.85$  (case) &  $26.46 \pm 4.86$  (controls) years. Maximum study subjects had only primary education. The majority of the respondents were homemakers in all groups. Most of the study subjects were from lower-middle-income groups in both cases and controls (Table 1). Respondents' mean gestational age was  $36.28 \pm 2.12$

(case) &  $36.57 \pm 1.82$  (control) weeks respectively and was significant in both case and control groups ( $p=.001$ ). There was no statistical difference according to gravida found between the cases and controls. Irregular antenatal checkup was found significantly more ( $p=0.004$ ) in patients with preeclampsia (38,67.9%) than in controls (23,41.1). The mean systolic blood pressure (SBP) was found  $164.50 \pm 18.13$  in cases &  $109.88 \pm 9.14$  in controls. The mean diastolic blood pressure (DBP) was found  $110.82 \pm 14.86$  in cases &  $69.50 \pm 7.75$  in controls. The association of SBP and DBP between the case and control was statistically significant ( $p<.001$ ). Maternal serum  $\beta$ -hCG concentration was maximum in cases ( $21301 \pm 10102$  mIU/ml) compared to the controls ( $12731 \pm 4133$  mIU/ml). An unpaired t-test was done and this difference was statistically significant ( $p<.001$ ) (Table 2). Based on maternal outcomes, delivery by cesarean section was greater in cases than in controls ( $p<0.001$ ), most of the control group underwent normal vaginal delivery (NVD) & eclampsia ( $p<0.001$ ) and Postpartum hemorrhage (PPH) ( $p=0.002$ ) were significantly lower in controls than cases. Based on the neonatal outcome, birth weight was significantly lower in cases than controls ( $p=0.020$ ), stillbirth was significantly lower in controls than cases ( $p=0.042$ ), several NICU admission was considerably higher in cases than controls ( $p=0.004$ ), and APGAR score at 1 min and 5 min were significantly lower in cases than controls (In 1 min,  $p=0.001$  and 5 min,  $p<0.001$ ) (Table 3).

**Table 1: Distribution of the study population based on Demographic profile (N=112)**

Characteristics	Case (n=56) n (%)	Control (n=56) n (%)	p-value
<b>Age (Years)</b>			
Mean $\pm$ SD	$27.35 \pm 4.85$	$26.46 \pm 4.86$	
<b>Educational status</b>			
Illiterate	2 (3.6%)	2 (3.6%)	.085 <sup>ns</sup>
Primary	23 (41.1%)	36 (64.3%)	
Secondary	17 (30.4%)	12 (21.4%)	
Higher secondary	11 (19.6%)	6 (10.7%)	
Graduate	3 (5.4%)	0 (0.0%)	
<b>Occupation</b>			
Homemaker	48 (85.7%)	52 (92.9%)	.474 <sup>ns</sup>
Service holder	6 (10.7%)	3 (5.4%)	
Student	2 (3.6%)	1 (1.8%)	
<b>Monthly family income (BDT)</b>			
Low-income (<6000)	20 (35.7%)	21 (37.5%)	.125 <sup>ns</sup>
Lower-middle-income (6000-25000)	32 (57.1%)	35 (62.5%)	
Upper-middle-income ( $\geq$ 26000)	4 (7.1%)	0 (0.0%)	

**Table 2: Distribution of the study population based on Obstetric history (N=112)**

Obstetric history	Case (n=56) n (%)	Control (n=56) n (%)	p-value
<b>Gestational age (weeks)</b>			
<37	29 (51.8%)	20 (35.7%)	.001 <sup>s</sup>
$\geq$ 37	27 (48.2%)	36 (64.3%)	
Mean $\pm$ SD	$36.28 \pm 2.12$	$36.57 \pm 1.82$	

Obstetric history	Case (n=56) n (%)	Control (n=56) n (%)	p-value
<b>Gravida</b>			
Primigravida	11 (19.6%)	12 (21.4%)	.815 <sup>ns</sup>
Multigravida	45 (80.4%)	44 (78.6%)	
<b>Antenatal checkup</b>			
Irregular	38 (67.9%)	23 (41.1%)	.004 <sup>s</sup>
Regular	18 (32.1%)	33 (58.9%)	
<b>Blood pressure (BP)</b>			
SBP (mmHg)	164.50 ± 18.13 (135 - 210)	109.88 ± 9.14 (95 - 128)	<.001 <sup>s</sup>
DBP (mmHg)	110.82 ± 14.86 (90 - 175)	69.50 ± 7.75 (60 - 85)	
<b>B-hCG concentration (mIU/ml)</b>	21301 ± 10102 (8931 - 44530)	12731 ± 4133 (4182 - 21566)	<.001 <sup>s</sup>

**Table 3: Distribution of the study population based on Maternal & Neonatal Outcomes (N=112).**

Outcome	Case (n=56) n (%)	Control (n=56) n (%)	p-value
<b>Maternal outcome</b>			
<b>Mode of delivery</b>			<.001 <sup>s</sup>
NVD	13 (23.2%)	31 (55.0%)	
Cesarean section	43 (76.8%)	25 (45.0%)	
<b>Maternal mortality</b>	0 (0.0%)	0 (0.0%)	
<b>Eclampsia</b>	11 (19.6%)	0 (0.0%)	<.001 <sup>s</sup>
<b>PPH</b>	12 (21.4%)	1 (1.8%)	.002 <sup>s</sup>
<b>Abruption placenta</b>	5 (8.9%)	0 (0.0%)	.057 <sup>ns</sup>
<b>Acute renal failure</b>	0 (0.0%)	0 (0.0%)	
<b>HELLP</b>	2 (3.6%)	0 (0.0%)	.495 <sup>ns</sup>
<b>Stroke</b>	0 (0.0%)	0 (0.0%)	
<b>Neonatal outcome</b>			
<b>Birth weight (kg)</b>			.020 <sup>s</sup>
Below normal (<2.5)	30 (53.6%)	14 (25.0%)	
Normal (2.5 – 4.0)	25 (44.6%)	41 (73.2%)	
Macrosomia (>4.0)	1 (1.8%)	1 (1.8%)	
Mean ± SD	2.37 ± 0.79	2.69 ± 0.61	
Min-max	1.20 – 4.50	1.10 – 4.30	
<b>Live birth</b>	45 (80.4%)	53 (94.6%)	.042 <sup>s</sup>
<b>Stillbirth</b>	9 (19.6%)	3 (5.4%)	.110 <sup>ns</sup>
<b>IUGR</b>	6 (10.7%)	1 (1.8%)	.113 <sup>ns</sup>
<b>NICU admission</b>	13 (23.2%)	2 (3.6%)	.002 <sup>s</sup>
<b>APGAR score (1 min)</b>	7.54 ± 0.87	7.96 ± 0.19	.001 <sup>s</sup>
<b>APGAR score (5min)</b>	9.02 ± 1.57	9.88 ± 0.58	<.001 <sup>s</sup>

## DISCUSSION

Preeclampsia is one of the serious medical disorders that can occur about midway through pregnancy (after 20 weeks). Preeclampsia patients may experience high blood pressure, protein in their urine, swelling, headaches and blurred vision. This state needs to be treated by a health care provider. This case-control study was conducted to evaluate maternal and perinatal outcomes in women suffering from preeclampsia. In this present study, patients' age was from 18 to 35 years. The mean age of the study groups was 27.35 ± 4.85 years and 26.46 ± 4.86 years in cases and controls respectively. Another study depicted that the mean age of the cases and controls was 23.3 years and 24.3 years respectively [13]. The authors revealed that the mean age was 25.12 years and 23.68 years in cases and controls respectively [14]. No significant age difference was observed in other

studies carried out in India and Kurdistan, Iraq [15, 16]. In this present series, most of the respondents completed the primary level of education in both cases (41.1%) & controls (64.3%). The majority of the study subjects in cases (85.7%) and controls (92.9%) were housewives. Maximum respondents in cases (57.1%) and controls (62.5%) were from lower middle-income families. Related socioeconomic status was found in the study conducted in Dhaka [13]. Present complaints revealed that the mean gestational age of the study subjects was 36.28 ± 2.12 weeks, and 36.57 ± 1.82 weeks in cases and controls respectively. A similar study showed that the mean gestational age was 33.3 ± 3.6 weeks and 32.7 ± 4.2 weeks in cases and controls respectively (p=0.328) [13]. A similar article revealed that there was no significant difference in gestational age between cases and controls [14]. Most of the participants had

multigravida in both cases (80.4%) and controls (78.6%). Another similar finding depicted that most women (77.6%) were multiparous and there were no significant differences in parity distribution between the groups ( $p=0.537$ ) [16]. This present analysis found that the respondents who were not under regular antenatal checkups were found significantly more ( $p= 0.004$ ) in preeclampsia patients (67.9%) than that controls (41.1%). The present study depicted that the mean systolic BP was higher in cases ( $164.50 \pm 18.13$  mmHg) than in controls ( $109.88 \pm 9.14$  mmHg). Similarly, the mean diastolic BP was significantly higher in cases ( $110.82 \pm 14.86$  mmHg) and controls ( $69.50 \pm 7.75$  mmHg). In the current content, maternal serum  $\beta$ -hCG concentration was maximum in cases ( $21301 \pm 10102$  mIU/ml) compared to the controls ( $12731 \pm 4133$  mIU/ml). The mean serum  $\beta$ -hCG was  $29621 \pm 13299$  mIU/ml and  $11059 \pm 3478$  mIU/ml in preeclampsia patients and normotensive pregnant women found in another contradictory study [17]. Another related analysis found that high levels of  $\beta$  hCG in preeclamptic cases (16130 mIU/ml) than the normal pregnant group (4,621 mIU/ml) with a  $p$ -value  $< 0.001$  [18]. Another similar finding described  $\beta$ -hCG levels in 30 preeclampsia cases in their 3rd trimester and 30 antenatal women with normal BP, which showed a greater level of  $\beta$ -hCG values in preeclampsia [19]. In this current series, based on maternal outcomes, delivery by cesarean section was greater in cases than controls ( $p<0.001$ ), & eclampsia ( $p<0.001$ ) and PPH ( $p=0.002$ ) were significantly lower in controls than cases. Abruptio placenta was greater in cases compared to the control group. Another related study showed that the majority of preeclampsia patients (48.65.8%) underwent caesarean delivery and most of the patients experienced headaches with vision blurriness. This analysis also concluded that according to the blood pressure diagnosis incidence was observed in mild hypertension in 87.7% of cases & the disease progression to severe preeclampsia occurs from mild hypertension [20]. Another similar article found that 54% of women experienced morbidity that included abruptio placenta, HELLP syndrome, renal insufficiency and eclampsia and no women required further dialysis or intensive care admission, none of the women died [21]. In this current analysis, birth weight was significantly lower in cases than controls ( $p=0.020$ ), stillbirth was significantly lower in controls than cases ( $p=0.042$ ), the number of NICU admission was considerably higher in cases than controls ( $p=0.004$ ), and APGAR score at 1 min and 5 min were significantly lower in cases than controls. Another related article described that 55% of infants were live-born & only 10% of them survived, all with severe handicaps [21]. A related study carried out in the United Kingdom found a comparison of maternal and neonatal outcomes in preeclampsia women and one maternal death occurred in women with chronic hypertension and human immune deficiency virus [22]. A related published series demonstrated HELLP syndrome in the preeclampsia group diagnosed with severe hypertension. Birth weight

analysis between total birth weight, normal birth weight and low birth weight compared in both groups showed a significant difference, in 3 groups the preeclampsia group showed the birth weight was lower than normal [20]. A study carried out in the Netherlands found the study population had a better result than control group 1 about admission to NICU, mechanical ventilation and intracranial haemorrhage. Control group 2 had better outcomes than the study groups concerning birth weight, bronchopulmonary dysplasia, patent ductus arteriosus and retinopathy [23]. Preeclampsia is easily diagnosed during routine checks during pregnancy. During these antenatal appointments, blood pressure is regularly checked for signs of high blood pressure and a urine sample is tested to see if it contains protein. The outcomes of the current finding were good as no mother was dead during these periods. No severe complications rose during the study period

## CONCLUSION

Preeclampsia may be related to problems with the placenta initially in the pregnancy. Such difficulties carriage risks to the fetus, such as lack of nutrients and oxygen, which can damage fetal growth. Long-term health risks in women with preeclampsia are now well-recognized and include increased incidence of hypertension, and cardiovascular, cerebrovascular and renal disease. A very little amount of maternal complications and fetal complications rose and the outcome of the findings was satisfactory.

## Limitations of the study

The study was conducted in a selected tertiary care hospital. The sample was taken purposively, so biases may be arising which can impact the results. The sample size was short to analyze the accurate result. The study duration was too short so, the study findings cannot be generalized to the entire population.

## RECOMMENDATIONS

Public health efforts in Bangladesh should address the need for early diagnosis of preeclampsia patients. Formulating specific guidelines are essential. There is a necessity for setting a screening docket to cover all age groups for early detection and treatment of cases. Furthermore, strategies should be implemented to accelerate government programs.

To get robust data, multicenter studies are in great need of policymakers to interpret the demonstrable scenario and to take necessary steps towards mitigating this problem. The study can be undertaken with a large sample size. Random sampling techniques can be used. Multicenter prospective studies can be done for a longer duration.

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**Ethical approval:** The study was approved by the Institutional Ethics Committee

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