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Comparison of Maternal Status between Preeclamptic Cases and Normal Pregnant Women Having Gestational Age between 24 and 40 Weeks

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Abstract

Background: *Preeclampsia, a significant hypertensive disorder during pregnancy, poses major risks to maternal health, particularly in low-resource settings like Bangladesh. This condition, emerging after 20 weeks of gestation, is characterized by elevated blood pressure and proteinuria.*

Objective: *This study aimed to compare maternal status between preeclamptic cases and normotensive pregnant women with gestational ages between 24 and 40 weeks in Bangladesh.*

Methodology: *This case-control study was conducted in the Department of Obstetrics and Gynaecology at Dhaka Medical College and Hospital from January 2015 to December 2017. Pregnant women with preeclampsia were classified as cases, identified by a diastolic blood pressure >90 mmHg, systolic blood pressure >140 mmHg, and proteinuria of 1+ or more. Controls were normotensive pregnant women.*

Results: *Nearly half (48%) of the patients in Group A were 25 years old or younger, 34% were between 26 and 30 years old, and 18% were over 30 years old. In the control Group B, 46% were 25 years old or younger, 38% were between 26 and 30 years old, and 16% were over 30 years old. The mean age was nearly identical between the groups (26.6 ± 5.7 vs. 26.2 ± 5.3; p = 0). Past history of preeclampsia was significantly higher in the case group (14% vs. 2%, $p < 0.05$). Mean systolic and diastolic blood pressures were significantly higher in cases compared to controls (160.2 ± 15.5 vs. 103.6 ± 22.1, $p < 0.001$ and 106.2 ± 18.3 vs. 67.8 ± 8.9, $p < 0.001$, respectively). Severe proteinuria was predominant among preeclamptic patients.*

Conclusion: *This study reveals significant disparities between preeclamptic and normotensive pregnant women in Bangladesh, emphasizing preeclampsia's critical impact on maternal health.*

Keywords: *Preeclampsia, hypertensive proteinuria, blood pressure*

1. INTRODUCTION

Preeclampsia, a significant hypertensive disorder during pregnancy, is a major concern in maternal health, particularly in low-resource settings like Bangladesh.[1] This condition, typically emerging after 20 weeks of gestation, is characterized by elevated blood pressure and proteinuria.[2] Globally, preeclampsia affects 5-8% of pregnancies, with higher incidences reported in

developing countries, contributing to substantial maternal and perinatal morbidity and mortality.[3] In Bangladesh, where access to quality prenatal care can be limited, preeclampsia poses heightened risks to pregnant women, often leading to severe complications such as eclampsia, HELLP syndrome (hemolysis, elevated liver enzymes, low platelet count), and organ dysfunction. [4-5]

Preeclampsia significantly endangers maternal health, potentially leading to life-threatening conditions such as severe hypertension, stroke, and renal failure.[6-8] It also increases the risk of premature delivery, intrauterine growth restriction, and perinatal death.[9-10] The burden of preeclampsia in Bangladesh underscores the need for effective screening, timely diagnosis, and comprehensive management strategies to mitigate its adverse outcomes. [11-12]

This study aimed to compare the maternal status between preeclamptic cases and normotensive pregnant women with gestational ages between 24 and 40 weeks in Bangladesh. By examining maternal parameters such as blood pressure, proteinuria, biochemical markers, and demographic characteristics, the study seeks to identify distinct differences and potential risk factors associated with preeclampsia. In Bangladesh, the condition is further complicated by socio-economic factors, limited healthcare infrastructure, and inadequate prenatal monitoring, exacerbating its impact on maternal and fetal health.

In this case-control study conducted at Dhaka Medical College and Hospital, pregnant women were selected based on stringent criteria. Preeclamptic cases were identified by a diastolic blood pressure >90 mmHg, systolic blood pressure >140 mmHg, and proteinuria of 1+ or more. Controls were normotensive pregnant women free from pregnancy-related complications. By comparing these groups, the study aims to provide valuable insights into the maternal health disparities influenced by preeclampsia, contributing to improved healthcare strategies and outcomes for pregnant women in Bangladesh.

Understanding the maternal status in preeclampsia within the Bangladeshi context is crucial for developing targeted interventions, enhancing prenatal care, and ultimately reducing the condition's detrimental effects on maternal and fetal health.

2. Objective

To asses the comparison of maternal status between preeclamptic cases and normal pregnant women having gestational age between 24 and 40 weeks.

3. Methodology

This case-control study was conducted in the Department of Obstetrics and Gynaecology at Dhaka Medical College and Hospital, Dhaka, from January 2015 to December 2017, spanning two years. Participants were sourced from both the inpatient and outpatient departments of the Obstetrics and Gynaecology Department at DMCH. The study involved two random clean catch urine specimens collected at least four hours apart, after excluding other urinary pathologies. Pregnant women with gestational ages between 24 and 40 weeks who exhibited features of preeclampsia, such as a diastolic blood pressure >90 mmHg, systolic blood pressure >140 mmHg, and proteinuria of 1+ or more, were classified as cases. Pregnant women without preeclampsia, within normal ranges of systolic and diastolic blood pressure, and free from any complications related to pregnancy or medication were classified as controls. A purposive sampling method was used following inclusion and exclusion criteria.

Patient evaluation was based on history, physical examination, and investigations. Excluded from the study were patients with known acute or chronic renal disease, diabetes mellitus, heart failure, hepatic dysfunction, or thyroid dysfunction. All participants were given an explanation of the study and informed consent was obtained. Data was collected using structured interviews, observation, clinical examination, and biochemical investigation from patient history sheets. Under aseptic conditions, 2 cc of venous blood was drawn from the antecubital vein using a disposable plastic syringe, and the blood was transferred to a test tube for serum ionized magnesium determination. This investigation was conducted by the Biochemistry Department at BIRDEM Hospital using a multi-system automatic analyzer. Serum ionized magnesium levels were divided into two groups using a cut-off value of 0.7 mmol/l and compared between cases and

controls to assess the association with preeclampsia and the risk of developing preeclampsia. Data were processed and analyzed using SPSS (Statistical Package for Social Sciences) version 11.5.

Descriptive statistics, Chi-square (χ^2) test, Student's t-test, and Odds Ratio were used for analysis. A significance level of 0.05 was used, with $p < 0.05$ considered significant.

4. RESULTS

Table I shows nearly half (48%) of the patients in Group A were 25 years old or younger, 34% were between 26 and 30 years old, and 18% were over 30 years old. In the control Group B, 46% were 25 years old or younger, 38% were between 26 and 30 years old, and 16% were over 30 years old. The mean age was nearly identical between the groups (26.6 ± 5.7 vs. 26.2 ± 5.3; p = 0).

Table I. *Age distribution between groups (n = 100)*

Age (years)	Group		p-value
	Group-A (n = 50)	Group-B (n = 50)	
≤ 25	24(48.0)	23(46.0)	
26 - 30	17(34.0)	19(38.0)	0.909
> 30	9(18.0)	8(16.0)	
Mean ± SD	**26.6 ± 5.7**	**26.2 ± 5.3**	

Table II showed that among the 50 preeclamptic cases, 56% were primigravida compared to 40% in the control group, while 44% were multigravida compared to 60% in the control group, with a p-value of 0.109. Additionally, 60% of the preeclamptic cases had a gestational age of 34 weeks or less, compared to 58% in the control group, while 40% of the cases had a gestational age greater than 34 weeks compared to 42% in the control group, with a p-value of 0.839.

Table II. *Gestational age and Gravida of the study Group*

Gravida	Group		p-value
	Case (n = 50)	Control (n = 50)	
Primi	28(56.0)	20(40.0)	0.109
Multi	22(44.0)	30(60.0)	
Gestational age (weeks)	**Group**		**p-value**
	Case (n = 50)	Control (n = 50)	
≤ 34	30(60.0)	29(58.0)	0.839
> 34	20(40.0)	21(42.0)	

Table III illustrates that past PET was significantly higher in Case than (14%) that in Control (2%) ($p < 0.05$).

Table III. *Past history of PET between groups*

Past history of PET	Group		p-value
	Case (n = 50)	Control (n = 50)	
Yes	7(14.0)	1(2.0)	0.030
No	43(86.0)	49(98.0)	

Table IV shows the mean systolic blood pressure and mean diastolic BP was significantly higher in Cases compared to Control (160.2 ± 15.5 vs. 103.6 ± 22.1; $p < 0.001$ and 106.2 ± 18.3 vs. 67.8 ± 8.9, $p < 0.001$ respectively).

Table IV. *Distribution of patients by blood pressure between groups*

Blood pressure	Group		p-value
	Cases (n = 50)	Control (n = 50)	
Systolic BP	160.2 ± 15.5	103.6 ± 22.1	<0.001
Diastolic BP	106.2 ± 18.3	67.8 ± 8.9	<0.001

In both the samples of urine (morning samples and samples after 4 hours) around two-third of the patients had severe proteinuria. Moderate proteinuria in each sample was 18%, while mild proteinuria in morning sample was 16% and 14% in sample taken 4 hours later (Table V).

Table V. *Distribution of cases by urine protein (n = 50)*

Proteinuria at different times	Frequency	Percentage
Urine sample at morning		
Mild proteinuria (+) (30mg/dl)	8	16.0
Moderate proteinuria (++) (100mg/dl)	9	18.0
Severe proteinuria (+++) (300mg/dl)	33	66.0
Urine sample after 4 hours		
Mild proteinuria (+)	7	14.0
Moderate proteinuria (++)	9	18.0
Severe proteinuria (+++)	34	68.0

5. DISCUSSION

A total number of 100 pregnant women were included in this study in whom the numbers of preeclamptic cases were 50 and controls were 50. Pregnant women with gestational age between 24 and 40 weeks, having diastolic blood pressure >90 mmHg and systolic BP >140 mmHg with proteinuria (1+ or more by Dipstick test) were enrolled as Cases.

On the other hand, pregnant women of gestational age between 24 and 40 weeks with both diastolic and systolic blood pressure within normal range and free from any medical or obstetric complications were included as control population.

Women with previous history of essential hypertension; patients with known chronic renal disease, diabetes mellitus, heart failure, hepatic dysfunction or thyroid disorders and women who previously received magnesium (Mg) or diuretics were excluded from the study.

Nearly half (48%) of the Cases was 25 or below 25 years, 34% between 26 – 30 years and 18% of them was more than 30 years of age. Among the control populations 46% was ≤ 25 years, 38% between 26 – 30 years and 16% was more than 30 years of age. The mean age was almost identical between groups (26.6 ± 5.7 vs. 26.2 ± 5.3; p = 0.730). Several studies conducted on present topics have shown similar age distribution between preeclamptic women and normal pregnancies. [13-14] But a research work done by Standley et al., included relatively younger age subjects both for Controls and Cases (mean age (20.1 ± 0.5 vs. 22.0 ± 0.8). [15]

Sixty percent of the patients in Cases had gestational age 34 or below 34 weeks and the remaining 40% above 34 weeks, while in Control 58% of patients had gestational age 34 weeks or below and 42% more than 34 weeks. Primi gravida was observed to be higher in Case (56%) than that in Control (40%).

Incidence of past PET was higher in Case than that in control. However, the obstetric variables like gestational age, gravida were all homogeneously distributed between groups.

The mean systolic blood pressure and mean diastolic BP was significantly higher in Cases compared to Control (160.2 ± 15.5 vs. 103.6 ± 22.1; $p < 0.001$ and 106.2 ± 18.3 vs. 67.8 ± 8.9, $p < 0.001$ respectively). Other study demonstrated that systolic blood pressure and diastolic blood pressure are higher in the preeclamptic group than that of normal pregnancies which is consistent with our present study.[13]

Several studies have reported similar trends in blood pressure elevation among preeclamptic women, reinforcing the findings of this study.[16-17] Elevated blood pressure in preeclampsia is associated with endothelial dysfunction, increased vascular resistance, and reduced placental perfusion, contributing to adverse maternal and fetal outcomes.[18] Moreover, proteinuria, a hallmark of preeclampsia, was significantly more prevalent among cases, highlighting renal impairment due to the disease process. These findings emphasize the critical need for routine blood pressure monitoring and early detection of proteinuria in pregnant women to prevent complications. Future research should explore preventive strategies and targeted interventions to improve maternal and fetal health outcomes in preeclamptic pregnancies.

6. LIMITATIONS OF THE STUDY

The study was conducted in a single hospital, limiting the generalizability of findings to a

broader population. The sample size was relatively small, which may affect the statistical power and robustness of the conclusions.

7. Conclusion

In conclusion, this study highlights significant differences between preeclamptic cases and normotensive pregnant women in Bangladesh, underscoring the critical impact of preeclampsia on maternal health. The age distribution between the groups was nearly identical, with no significant differences. However, a higher prevalence of past preeclampsia was observed in the case group (14% vs. 2%, $p < 0.05$). Additionally, mean systolic and diastolic blood pressures were significantly higher in preeclamptic women compared to controls (160.2 ± 15.5 vs. 103.6 ± 22.1, $p < 0.001$ and 106.2 ± 18.3 vs. 67.8 ± 8.9, $p < 0.001$, respectively). Severe proteinuria was predominant among preeclamptic patients, with around two-thirds exhibiting severe proteinuria in both morning and subsequent urine samples. These findings emphasize the need for enhanced prenatal monitoring and management strategies to mitigate the adverse outcomes associated with preeclampsia in this population.

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