

## Plasma Fibrinogen and Fibrin Degradation Product (FDP) in Preeclampsia

Sharmin Sultana <sup>\*1</sup>, Susmita Nargis <sup>2</sup>, Heera Lal Roy <sup>3</sup>, Qazi Shamima Akhter <sup>4</sup>, Rukhsana Afroz <sup>5</sup>

### Abstract

**Introduction:** Hypercoagulable state is seen in preeclampsia which acts as a risk factor for thromboembolism & DIC. Altered coagulation indices (serum Fibrinogen & FDP) have been reported in patients with preeclampsia and have been suggested as a sensitive marker for detection of bleeding complications. This study was carried out to compare the coagulation indices in preeclamptic women. **Materials & Methods:** This cross sectional study was conducted in the Department of Physiology, Dhaka Medical College (DMC), Dhaka from January to December 2014. Total 100 women aged 18 – 40 years were selected from the department of Obstetrics & Gynaecology of DMCH, Dhaka for this study. Among them 50 were preeclamptic and age matched 50 healthy nonpregnant women were considered as control group. Fibrinogen & Fibrin Degradation Product (FDP) were analyzed on automated coagulation analyzer. **Result:** In this study, serum Fibrinogen & FDP were significantly higher in preeclamptic than those of healthy women. Moreover, 100% & 64% preeclamptic patient had raised serum Fibrinogen & FDP respectively. **Conclusion:** From this study it can be concluded that serum Fibrinogen & FDP are directly related with preeclampsia.

**Keywords:** Preeclampsia, Plasma fibrinogen, Fibrin degradation product.

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### \*1. Corresponding Author: Dr. Sharmin Sultana

Assistant Professor, Department of Physiology  
Ad-din Sakina Medical College, Jessore.  
Email:sharminsultana2015@yahoo.com

### 2. Dr. Susmita Nargis

Assistant Professor, Department of Biochemistry  
Ad-din Sakina Medical College, Jessore.

### 3. Dr. Heera Lal Roy

Assistant Professor, Department of Biochemistry  
Khulna City Medical College, Khulna.

### 4. Dr. Qazi Shamima Akhter

Professor, Department of Physiology  
Dhaka Medical College, Dhaka.

### 5. Dr. Rukhsana Afroz

Assistant Professor, Department of Physiology  
Bikrampur Bhuiyan Medical College, Munshiganj, Dhaka.

### Introduction

Preeclampsia is a pregnancy specific, idiopathic multisystem disorder characterized by the development of hypertension and proteinuria after the 20 weeks of gestation<sup>1,2</sup>. It may present itself as a primary disorder or may complicate pre-existing pathology like chronic hypertension or chronic nephritis<sup>3</sup>.

Preeclampsia can be categorized clinically as (1) mild preeclampsia (blood pressure >140/90mm Hg and proteinuria upto 1+) and (2) severe preeclampsia (blood pressure >160/110mm Hg with proteinuria > 1+)<sup>4</sup>. According to the time of onset, preeclampsia can also be categorized as (1)early onset preeclampsia (before 34 wks gestation) and

(2) late onset preeclampsia (after 34 wks gestation)<sup>5</sup>.

Preeclampsia creates a functional derangement of multiple organ system. Complications of preeclampsia include eclampsia, placental abruption, ascities, hepatic infarction and rupture, intra-abdominal bleeding, pulmonary edema and acute renal failure. Twenty percent (20%) of women with severe preeclampsia develops HELLP syndrome (hemolysis, elevated liver enzymes, low platelets) and the same percentage (20%) among HELLP syndrome develops disseminated intravascular coagulation (DIC). Complications affecting the developing fetus include intrauterine growth retardation, prematurity, oligohydramnios, bronchopulmonary dysplasia and increased risk of perinatal death<sup>2</sup>. During normal pregnancy profound changes occur in the coagulation and fibrinolytic system of the mother causing a hypercoagulable state. In preeclampsia there is a distinct possibility of accentuation of this hypercoagulable state of pregnancy<sup>4</sup>.

Numerous studies observed coagulation abnormalities in preeclampsia. The level of anticoagulants such as antithrombin III, protein C and protein S are decreased in these groups. The clotting factors such as factor VIII and von Willebrand factors are elevated in preeclampsia. There is also increase in plasminogen activator inhibitor type 1(PAI-1) in preeclampsia. So preeclampsia is a highly thrombotic and procoagulant state<sup>1</sup>.

Fibrinogen is the primary blood clotting factor. Fibrin clot is formed from fibrinogen. Fibrinogen plays a vital role in the process of inflammation, atherogenesis and thrombogenesis. Fibrinogen is a cofactor in platelet activation and may directly contribute to platelet plaque

formation. This higher serum fibrinogen level may increase the blood viscosity, platelet aggregation and causes thrombus formation<sup>7,8</sup>.

Fibrin degradation products are component of the blood produced by clot degeneration. These are produced by the action of plasmin on deposited fibrin.

An excess of FDP indicates the increased intravascular coagulation and increase in fibrinolytic activity in severe preeclampsia<sup>9</sup>.

Several studies showed increased serum fibrinogen and FDP in patients with severe preeclampsia<sup>9,10</sup>. But some studies found low serum fibrinogen level in severe preeclampsia<sup>6, 11,12</sup>.

From the above studies, it has been observed that the result is conflicting. Several studies have done abroad to observe the fibrinogen and FDP levels in these groups but their exact relationship with preeclampsia still debatable. As, there is less published data available regarding this topic in our country, the relationship among these parameters in the Bangladeshi preeclamptic is not precisely known. Furthermore, we need a data from which we can compare these parameters in our population.

**Materials and Methods**

This cross sectional analytic study was conducted in the Department of Physiology, Dhaka Medical College, Dhaka, during the period from January 2014 to December 2014. Protocol of this study was approved by Ethical Review Committee of Dhaka Medical College, Dhaka. For this study, 50 diagnosed preeclamptic women aged 18 to 40 years were selected as group B. Age matched 50 healthy nonpregnant women were considered as control group (group-A) for comparison. The subjects were selected from department of Obstetrics and Gynaecology, Dhaka Medical College Hospital and from personal contact in different areas of Dhaka city by simple random sampling. After selection the nature, purpose, benefit and risks of the study were explained in details. Informed written consent was taken from the participants. Before taking blood detailed family and medical history were taken and recorded in a prefixed data schedule. Plasma fibrinogen and fibrin degradation product (FDP) were estimated on automated coagulation analyzer, Sysmex CA – 500 series. Plasma fibrinogen was estimated by using the Dade ® Fibrinogen determination reagent. Plasma fibrinogen was estimated by using the latex particles coated with monoclonal antibodies to FDP. In addition BMI was calculated and blood pressure was measured. Presence of proteinuria was determined by conventional heat coagulation test<sup>13</sup>. Then interpretation of the heat coagulation test was done according to presence of turbidity in the urine as nil/trace (0), 1+, 2+, 3+ and 4+<sup>13,14</sup>. For statistical analysis one-way ANOVA test, Bonferroni test and Pearson’s correlation co-efficient (r) test were performed by using SPSS version 22.

**Results**

In this study, the plasma fibrinogen level was significantly (p<0.001) higher in preeclampsia in comparison to control

group. Again, the plasma fibrin degradation product (FDP) was significantly (p<0.001) higher in preeclampsia in comparison to control group.

**Table-I: General characteristics of the subjects in different groups (n=100).**

Parameters	Healthy nonpregnant (n=50)	Preeclampsia (n=50)
Age (years)	28.24±4.63	26.86±5.33
BMI (kg/m <sup>2</sup> )	26.17±2.58	27.72±3.5
SBP (mmHg)	112.2±7.1	159.8±19.2*
DBP (mmHg)	73.0±6.1	110.0±9.9*
Urinary protein level (gm/L)	-	1.34±1.72*

Results are expressed as Mean ±SD. Figures in parentheses indicate range. One-way ANOVA test was performed to compare among groups. n = Number of subjects. \*p<0.001, compared to control. BMI= Body mass index; SBP= Systolic blood pressure; DBP= Diastolic blood pressure.

The mean systolic(159.8±19.2mmHg) and diastolic (110.0±9.9mmHg) blood pressure were significantly higher in preeclampsia compared to healthy non pregnant women (SBP 112.2±7.12 mmHg, DBP 73.0±6.1mmHg) difference was significant. Again, the mean urinary protein level was significantly higher 1.34±1.72 gm/L in preeclampsia compared to healthy non pregnant women.

**Table-II: Fibrinogen and FDP of the subjects in different groups (n=50).**

Groups	N	Fibrinogen(mg/dl)	FDP (µg/ml)
A	50	312.4±102.5	4.85±2.64
B <sub>2</sub>	50	665.2±99.1*	14.1±118*

Results are expressed as Mean ±SD. Figures in parentheses indicate range. One-way ANOVA test was performed to compare among four groups. Bonferroni test was performed to compare between groups. n = Number of subjects; \* p < 0.05.

The mean serum fibrinogen (665.2±99.1mg/dl) and FDP(14.1±118 µg/ml) level were significantly higher in preeclampsia than healthy non pregnant women.

**Table-III: Distribution of the subjects by Fibrinogen and FDP in study groups.**

Parameters	B <sub>2</sub> n(%)
Fibrinogen < 400 mg/dl	0 (0.0%)
> 400 mg/dl	50 (100%)
FDP < 5µg/ml	18 (36%)
> 5 µg/ml	32 (64%)

Results are expressed as frequency and percentage. n = Number of subjects

Group A : Healthy adult non pregnant women (Control group)

Group B<sub>2</sub> : Women with preeclampsia (Study group)

Moreover in this study, elevated plasma fibrinogen (>400mg/dL) and plasma fibrin degradation product (FDP) (>5 µg/ml) were found in 100% and 64% of preeclamptic women respectively.

### Discussion

In the present study, mean plasma fibrinogen level was higher in preeclamptic women than healthy nonpregnant female. This finding was in agreement with those of different researchers of different countries<sup>9, 10</sup>. But some investigators did not find significant difference of plasma fibrinogen level between preeclamptic women and healthy non pregnant female<sup>6, 11</sup>.

In this study plasma fibrin degradation product (FDP) was higher in preeclamptic women than healthy non pregnant female. This result is similar to other authors<sup>6,9-12,15</sup>.

But some investigators did not find significant difference of plasma fibrin degradation product (FDP) level between preeclamptic women and healthy non pregnant female<sup>16</sup>.

Literature review suggested that raised plasma fibrinogen and FDP in preeclampsia were due to the exaggerated systemic inflammatory response and fibrinolytic activity<sup>9</sup>.

In the present study, raised plasma fibrinogen and FDP in preeclampsia than control women is attributed to these facts.

### Conclusion

From the result of this study, it may be concluded that increased plasma fibrinogen and FDP level may act as a future risk of developing thromboembolic disorder and disseminated intravascular coagulation in preeclampsia. Therefore, estimation of these parameters in preeclampsia may provide information for further medical care and will minimize the further complications thereby reducing both maternal and fetal mortality and morbidity.

**Conflict of Interests:** None.

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