

High Troponin I Level among Patients with Severe preeclampsia

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Abstract: Hypertensive disorders of pregnancy are still one of the major issues of obstetrics. Few studies have been conducted on the troponin level of pregnant women and the results of these studies are not conclusive, therefore we aimed to investigate the difference between its level among patients with severe preeclampsia, mild preeclampsia and normotensive pregnant women. This was a case control study that was conducted on all pregnant women who attended Arash Hospital in 2011-12. In this study, 144 samples were allocated into three groups. For each patient, age, body mass index (BMI), gravidity, parity, liver enzymes and platelet counts were collected and the troponin I level was measured in Shahid Rajai laboratory. The level of troponin I was normal if it was below 0.01. The troponin I level of none of the participants of control group was abnormal. Among the patients with mild preeclampsia, only one patient (2.08%) had high levels of troponin I and in the third group, 7 (14.58%) had high levels of troponin I. The difference between the troponin I levels of the severe preeclampsia group and the control group was significant ($P=0.01$). On the other hand, no significant difference was observed between the other groups ($P>0.05$). According to the findings of this study and similar studies, troponin I levels increase more in patients with preeclampsia compared with normotensive pregnancies.

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1. Introduction

Hypertensive disorders of pregnancy are still one of the major issues of obstetrics. Preeclampsia is a syndrome that occurs after the 20th week of pregnancy in normotensive women and affects most of the organs by decreasing their perfusion (Brown, Lindheimer et al. 2001, Chandiramani and Shennan 2008, Erez, Romero et al. 2008).

The levels of fibronectin, trombosmodulin, endothelin and thromboxan increase in preeclampsia. However, nitric oxide level decreases. Compared to normotensive women, patients with preeclampsia have dysfunction in their vasodilator mediators. But it is still unclear whether this is due to the disease or is its cause. Troponin I is a sensitive and specific marker for myocyte injury and myocardial damage (Atalay, Erden et al. 2005). Although many studies (Atalay, Erden et al. 2005, Rath and Fischer 2009) have reported elevated troponin I levels among preeclampsia patients, recent studies (Fleming, O'Gorman et al. 2000, Atalay, Erden et al. 2005, Joyal, Leya et al. 2007) have failed to show such relations. This inconsistency may be due to different specifications of patients such as present systemic diseases or their intravascular volume status.

Determining mild cardiac damage is an important factor in evaluating patients with

preeclampsia and plays a crucial role in the treatment and prognosis of a patient (Atis, Aydin et al. 2010). Cardiac troponin I increases in response to myocardial damage and is one of the most specific and sensitive markers of ischemic and non ischemic myocardial damage (Atalay, Erden et al. 2005). Hypertensive patients don't have obvious myocardial necrosis. However, their troponin I level is above the normal range and is a sign of subclinical myocardial necrosis (Atis, Aydin et al. 2010).

Few studies have been conducted on the troponin level of pregnant women and the results of these studies are not conclusive, therefore we aimed to investigate the difference between its level among patients with severe preeclampsia, mild preeclampsia and normotensive pregnant women.

2. Material and Methods

This was a case control study that was conducted on all pregnant women who attended Arash Hospital in 2011-12. In this study, 144 samples were allocated into three groups; considering a two sided confidence level of 95 percent, a power of 80 percent, an exposure rate of 50 percent for the preeclampsia groups and 20 percent for the control group, the size of each group was calculated to be 48. Singleton pregnant women with a gestational age

above 20 weeks, who fulfilled preeclampsia criteria, and agreed to participate in this study, were eligible.

Severe preeclampsia was defined as systolic blood pressure (SBP) of 160 or above, diastolic blood pressure (DBP) of 110 or above, 24 hour proteinuria above 2 grams or $\leq +2$ protein detected by dipstick, serum creatinine above 1.2, platelets below 100000, microangiopathic hemolysis, rise in aspartate aminotransferase (AST) or alanine aminotransferase (ALT), persistent headache, visual disturbances, and persistent epigastric pain.

Mild preeclampsia was defined as SBP of 140 or above or DBP of 90 or above that occurs after 20 weeks of gestational age and a proteinuria of 300 mg per day or $\leq +1$ protein detected by dipstick.

Patients with overt diabetes, gestational diabetes, infections, premature rupture of membrane (PROM), oligohydramnios, polyhydramnios, valvular heart disease, chronic hypertension, chronic kidney disease, and patients who received inotropic drugs or ergotamine maleate around the time of surgery were excluded from the study.

For each patient, age, body mass index (BMI), gravidity, parity, liver enzymes and platelet counts were collected and the troponin I level was measured in Shahid Rajai laboratory. The level of troponin I was normal if it was below 0.01. Also, a level above 0.11 was in favor of acute myocardial infarction and a level between these two was suggestive of unstable angina.

This study was approved by the ethics committee of Tehran University of Medical Sciences and all data remained confidential.

Data was expressed as mean \pm standard deviation (SD) and the statistical significance was evaluated with T-test using Statistical Package for the Social Sciences (SPSS) version 16. A P-value below 0.05 was considered as significant.

3. Results

In this study, 144 participants were divided into three groups of 48 patients. As shown in table 1, the differences between age, gestational age, gravidity, parity and hemoglobin of the participants of the three groups were not significant.

The troponin I level of none of the participants of control group was abnormal. Among the patients with mild preeclampsia, only one patient (2.08%) had high levels of troponin I and in the third group, 7 (14.58%) had high levels of troponin I. The difference between the troponin I levels of the severe preeclampsia group and the control group was significant ($P=0.01$). On the other hand, no significant difference was observed between the other groups ($P>0.05$).

Table -1: Baseline characteristics of the three groups of the study

	Control		Mild		Severe		P
	Mean	SD	Mean	SD	Mean	SD	
Age	28.06	3.59	29.46	5.45	29.69	5.58	$P>0.05$
Gestation age	36.73	0.44	36.67	1.71	36.38	1.34	$P>0.05$
Gravidity	1.48	0.65	1.73	0.89	1.71	1.01	$P>0.05$
Parity	0.48	0.65	0.58	0.76	0.52	0.87	$P>0.05$
Hb	11.57	0.59	11.5	1.43	11.19	1.42	$P>0.05$

As shown in table 2, four patients of the severe preeclampsia group had a troponin level of the same range of myocardial infarction.

Table -2: Range of cardiac troponin I level of the patients of the three groups

	Control	Mild	Severe	Total
Normal range	48	47	47	136
Unstable angina	0	1	3	4
Myocardial infarction	0	0	4	4
Total	48	48	48	144

4. Discussions

This study was conducted to evaluate the difference of cardiac troponin level of patients with normal pregnancy, mild and severe preeclampsia. In this study, the difference between troponin I levels of the severe preeclampsia group and the control group were significant.

This result was consistent with the findings of Fleming et al and Atalay et al (169, 171) and they also found a relationship between preeclampsia and high cardiac troponin I levels. However, Aydin et al, Joyal et al and Atis et al did not find such a relationship (Joyal, Leya et al. 2007, Aydin, Baloglu et al. 2009, Atis, Aydin et al. 2010). These differences in the findings may be related to the time of onset of preeclampsia. Hamad et al showed in their study that early preeclampsia is related to left ventricular dysfunction (Hamad, Larsson et al. 2009).

In our study, troponin levels in the range of myocardial infarction were only seen in patients with severe preeclampsia. This may highlight the importance of cardiac consultations in these patients. One of the limitations of this study was that patients were not matched for their body mass index (BMI). Also, the results of the cardiac consultations were not followed.

According to the findings of this study and similar studies, troponin I levels increase more in patients with preeclampsia compared with normotensive pregnancies. However, further studies with bigger sample size may be necessary for proving this issue. Since the prevalence of severe preeclampsia is not very high, cardiac consultation in these patients seems to be rational. Also, since the number of severe preeclampsia patients with high

levels of troponin I was high, further studies should be conducted to investigate this issue and to determine if measuring the troponin I level of patients with severe preeclampsia is necessary or not.

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