RELATION BETWEEN PREECLAMPSIA AND CARDIAC ENZYMES

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Abstract

INTRODUCTION: Preeclampsia affects about 5-10% of all pregnancies and is a major cause of maternal, fetal and neonatal mortality and morbidity. The cardiovascular system undergoes a host of changes in association with development of preeclampsia. LDH is a useful biochemical marker that reflects the severity of the occurrence of preeclampsia.

METHOD AND MATERIALS: One hundred pregnant women were selected for this study, 50 normal pregnant women as controls and 50 preeclamptic women as the study group. Cardiac enzymes (serum LDH, serum AST, serum CK and serum CKMB) of these women were analyzed.

RESULTS: Mean Serum LDH and mean serum AST concentrations were significantly higher in preeclamptic patients compared to normal pregnant women (348.34 ± 59.17 vs. 255.92 ± 43.26, $P < 0.01$) and (34.32 ± 10.37 vs. 22.06 ± 5.10, $P < 0.01$) respectively.

CONCLUSION: LDH and AST may be increased due to liver damage. This endothelial vascular damage is the main cause in the occurrence of preeclampsia. Higher levels of LDH and AST are very useful markers to identify the occurrence of preeclampsia.

Keywords: LDH, Preeclampsia, AST, Cardiac Enzymes.

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Introduction

Hypertensive diseases in pregnancy are one of the main reasons of maternal, fetal and neonatal morbidity and mortality. Since preeclampsia is a multisystem disorder with different clinical characteristics, prevention, diagnosis and therapy of this disease require a close interdisciplinary cooperation.[1] Preeclampsia is an important disorder of pregnancy, with potentially severe consequences for both mother and child.[2] Preeclampsia affects about 5-10% of all pregnancies and is a major cause of maternal, fetal and neonatal mortality and morbidity.[3] The etiology of preeclampsia is unknown but thought to be related to hypoxia in the placenta.[4] Preeclampsia and other hypertensive disorders of pregnancy are a leading global cause of maternal and infant illness and death. It is important to note that research shows that more women die from preeclampsia than eclampsia; also one is not necessarily more serious than the other. Preeclampsia (PE), eclampsia and pregnancy induced hypertension (PIH) becomes apparent at the late stages of pregnancy, usually in the third trimester.[5] Mild preeclampsia occurs in approximately 15% of pregnancies, moderate to severe preeclampsia in around 8% and severe preeclampsia in about 1% to 2%. Preeclampsia is a syndrome, which affects virtually all-maternal organ systems.[6] There is increasing evidence that endothelial cell and altered endothelial cell function play an important role in the pathogenesis of preeclampsia. LDH is most often measured to evaluate the presence of tissue damage. The enzyme LDH is in many body tissues, especially heart, liver, kidney, skeletal muscle, brain, blood cells, and lungs. Dysfunction of endothelial cells can contribute to inappropriate vasoconstriction and platelet aggregation which are early signs of atherosclerosis, hypertension and coronary vasospasm.[7] Acute clinical symptoms that danger fetus life in preeclampsia correlate with distinct activity of AST and LDH.[8] The cardiovascular system undergoes a host of changes in association with development of preeclampsia.[9] LDH is a useful biochemical marker that reflects the severity of the occurrence of preeclampsia.[10]

In the view of all above findings, this study aimed to evaluate the cardiac enzymes (serum LDH, serum AST, serum CK and serum CKMB) in pregnant women who develop preeclampsia.

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Materials and Methods

One hundred cases in the third trimester of pregnancy entered this study and were divided into two groups of preeclamptic and normal (n = 50 in each group). Blood samples were collected from Gynae Units of Jinnah, Civil, Holy Family Hospitals and Godhra Muslim Medical Center, Karachi.

Including criteria:

*Study Group: T*he study group included 50 preeclamptic women. Preeclampsia was defined as blood pressure constantly greater than 140/90 mmHg and proteinuria above 0.3 g/24 hour with no urinary tract infection and no previous history of hypertension.[8]

Control Group: The control group included 50 normal pregnant women (non-hypertensive, non-diabetic) who were age and gestational age matched with the study group.

Excluding Criterla: All diseased pregnant women were excluded from the study.

Specimen Collection: Peripheral blood samples were collected from all control and preeclamptic subjects. Blood was always collected before onset of labor. After clotting the blood, samples were centrifuged to separate serum for analysis.

Body Mass Index (BMI): BMI was calculated by dividing body weight (kg) by the square of height (meters).

Estimation of Serum Lactate **Dehydrogenase (LDH):** This method is based on the reduction of pyruvate to lactate in the presence of NADH by the action of lactate dehydrogenase. The pyruvate that remains unchanged reacts with 2,4-dinitrophenylhydrazone, which is determined calorimetrically in an alkaline medium.[11]

Estimation of Aspartate Aminotransferase (AST): SGOT (AST) is measured by monitoring the concentration of oxaloacetate hydrazone formed with 2,4-dinitrophenylhydrazine.[12]

Estimation of Serum Creatine Kinase (CK): Immunoinhibition Assay: An antibody is incorporated in the CK reagent. This antibody will bind to and inhibit the activity of the M subunit of CK-MB. This means that only the activity of B subunit in the serum is measured. If the activity of multiplied by a factor of 2, it will give the activity of CK-MB in serum.[13]

Estimation of Serum Creatine Kinase –MB (CKMB): CKMB is composed of two moieties CK-M and CK-B. A specific antibody inhibits the CK-M moiety without affecting the CK-B moiety. The CK-B fractions account for one half the activity of CK-MB; it is determined by NAC-activated method.[13]

Statistical analysis: Statistical Package for Social Sciences (SPSS version 15.0) was used for data entering and statistical analy-sis. Two samples independent t-test was used to find the significant differences between mean and standard deviation of ages, gestational ages, blood pressures, BMI, LDH, AST, CK, and CKMB of the two groups. Data are presented as mean + standard deviation. P value < 0.01 was considered statistically significant.

Results

Demographic data of normal and preeclamptic group is shown in table 1.

Blood pressure: Mean Systolic BP and mean diastolic BP of the preeclamptic group were significantly higher then the control group (166.20 ± 17.13 vs. 107.40 ± 8.58) P < 0.01 and (133.20 ± 15.57 vs. 80.00 ± 8.80) P < 0.01, respectively (table 1).

Patients and gestational ages:

Mean ages of mothers and mean gestational ages had no significant difference in preeclamptic and control groups (23.88 ± 3.19 vs. 23.62 ± 2.92) and (31.62 ± 1.87 vs. 31.98 ± 1.54), respectively (table 1).

Body Mass Index (BMI): Mean BMI of the preeclamptic group was significantly higher as compare to the control group (29.00 ± 2.15 vs. 27.62 ± 1.82) P < 0.01, respectively as shown in table 1.

Table 1. Clinical parameters of Controls and Preeclampsia

Parameters	Control	Preeclampsia
	n = 50	n = 50
Age	23.62 ± 2.92	23.88 ± 3.19
Gestational age	31.98 ± 1.54	31.62 ± 1.87
Systolic BP	107.40 ± 8.58	166.20 ± 17.13*
Diastolic BP	80.00 ± 8.80	133.20 ± 15.57*
BMI	27.62 ± 1.82	29.00 ± 2.15*

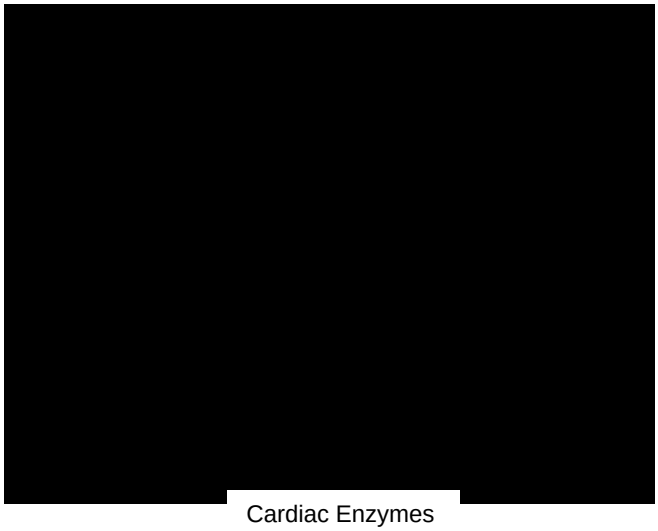

Figure 1. Mean of cardiac enzymes in normal pregnant and preeclamptic women

Table 2. Cardiac Enzymes of Normal and Preeclamptic groups

S #	Groups	LDH U/L	AST (SGOT) U/L	CK (CPK) U/L	CKMB U/L
1	Normal (n = 50)	255.92 ± 43.26	22.06 ± 5.10	88.96 ± 27.07	5.86 ± 3.39
2	Preeclamptic (n = 50)	348.34 ± 59.17*	34.32 ± 10.37*	81.14 ± 26.14	5.82 ± 2.60

LDH and AST: Mean Serum LDH and mean serum AST concentra tions were significantly higher in preeclamptic patients compare to normal pregnant women (348.34 ± 59.17 vs. 255.92 ± 43.26) $P < 0.01$ and (34.32 ± 10.37 vs. 22.06 ± 5.10) $P < 0.01$, respectively as shown in table 2 (Figure 1).

CK and CK-MB: Serum CK and serum CKMB levels had no significant difference in the two groups (81.14 ± 26.14 vs. 88.96 ± 27.07) and (5.82 ± 2.60 vs. 5.86 ± 3.39) as shown in table 2 (Figure 1).

Discussion

The results showed that the serum lactate dehydrogenase (LDH) and aspartate aminotransferase (AST) levels were significantly higher in women with preeclampsia, while serum creatine kinase (CK) and CKMB had no significant difference between the two groups as shown in table 2. The elevated LDH and AST levels in preeclampsia are also found in many other studies[8,10,14] (Figure 1).

Preeclampsia complicates 6% to 8% of all pregnancies with the majority of cases (75%) occurring during first pregnancies.[10] The prevalence, complications as well as correlation of maternal and fetal outcome in a community of Pakistani women showed high incidence of preeclampsia (19%).[15] The multi organ dysfunction in severe preeclampsia caused by vascular endothelial damage, including maternal liver, kidney, lungs, nervous system, blood and coagulation system will lead to excessive LDH leakage and elevated levels in serum due to cellular dysfunction, which may cause the occurrence of preeclampsia (Table 2). These results are also supported by H S Qublan, 2005.[10]

Lactate dehydrogenase (LDH) is an intracellular enzyme that converts lactic acid to pyruvic acid, and elevated levels indicate cellular death and leakage of enzyme from the cell as shown in our study (Table 2) and also supported by HS Qublan, 2005.[10]

AST (aspartate aminotransferase) is also an intracellular enzyme involved in amino acid and carbohydrate metabolism, its elevated levels show the damage in the organ whose cells are rich in this enzyme (i-e liver) (as shown in table 2 and also found in other studies[8,10,14]). LDH may be increased due to liver damage. This endothelial vascular damage is the main cause in the occurrence of preeclampsia.

Richard B Schwartz et al concluded that brain edema in patients with preeclampsia-eclampsia syndrome was primarily associated with laboratory-based evidence of endothelial damage (red blood cell morphology and LDH levels). Blood pressures, although elevated in all patients, were not significantly different in those with or without brain edema.[16]

Serum CK and CKMB levels did not show any difference between the normal and preeclamptic groups. This may be due to the fact that both of these enzymes may have no role in the occurrence of preeclampsia.

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