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Original Research Article

## Serum lactate dehydrogenase as a biochemical marker for maternal outcome in pre-eclampsia

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### ABSTRACT

**Background:** LDH is a cytoplasmic intracellular enzyme present in the heart, kidney, muscle, leukocytes and erythrocytes, of all major organ systems. The presence of LDH in extracellular space points towards cellular damage, endothelial dysfunction. Preeclampsia is a multisystem disorder during pregnancy causing cellular damage or death. Hence, serum LDH levels can be helpful in determining the extent of cell damage and the seriousness of this disease. The present study aimed to correlate the maternal serum lactate dehydrogenase levels with maternal and perinatal outcomes in women with pre-eclampsia.

**Methods:** It was a prospective observational study. A total of 120 antenatal patients diagnosed with hypertensive disorder of pregnancy were included in this study. Serum LDH levels were estimated by enzymatic method on the autoanalyzer. Patients were grouped into 3 categories according to serum LDH levels: a) <600 IU/l, b) 600-800 IU/l c) >800 IU/l. Clinical manifestation of development of complications of hypertensive disease and its relation with serum LDH in respective patients were analyzed.

**Results:** An LDH level of more than 800 IU/l was seen in 19.2% while between 600 to 800 IU/l was seen in 16.7% cases. A significant association was observed between incidence of maternal complications with high LDH levels ( $p < 0.01$ ). High LDH levels were observed to be associated with development of ante-partum haemorrhage, eclampsia and requirement of ICU admission. No significant association was found between different categories of LDH and deep tendon reflexes, levels of proteinuria at the time of admission in these preeclamptic women.

**Conclusions:** Close monitoring and early intervention of the preeclampsia patients with elevated serum LDH levels can help avoid adverse effects of the disease and thereby help improve maternal and perinatal outcomes in pregnant women with preeclampsia.

**Keywords:** Hypertensive disorders of pregnancy, Intra uterine growth retardation, Lactate dehydrogenase, Pre eclampsia

### INTRODUCTION

Preeclampsia is a multiorgan system disorder with multifactorial aetiology. It is defined by blood pressure of more than 140/90 mmHg on two separate occasions separated by 4-6 hours apart associated with proteinuria. It affects around 5-8% of all pregnancies.<sup>1</sup> The incidence is affected by parity, age and race, ethnicity, etc. A hospital-based study was conducted in India in 2006, in which the

incidence of hypertensive disorder of pregnancy was 5.38%, out of which preeclampsia, eclampsia and HELLP syndrome were 44%, 40% and 7% respectively and of chronic hypertension and chronic hypertension with superimposed preeclampsia were 9% in total.<sup>2</sup> Preeclampsia is associated with maternal and perinatal morbidity and mortality and other various complications such as DIC, HELLP, abruption, eclampsia etc.<sup>2-4</sup>

LDH levels have recently been proposed as possible indicators for predicting the severity of pre-eclampsia and as a multi-organ involvement predictor.<sup>5</sup>

LDH is a cytoplasmic intracellular enzyme present in the heart, kidney, muscle, leukocytes and erythrocytes, of all major organ systems. The presence of LDH in extracellular space points towards cellular damage, endothelial dysfunction. Preeclampsia is a multisystem disorder causing cellular damage or death. Hence, serum LDH levels can be helpful in determining the extent of cell damage and the seriousness of the disease. The complications of Preeclampsia such as abruption of placenta, failure of kidney and liver dysfunction and cardiovascular collapse could be life threatening. Thus, combining various biomarkers especially those related to vascular damage like lactate dehydrogenase may be helpful in determining the risk of occurrence of preeclampsia and thus may help in preventing it.<sup>5,6</sup>

So, this research aimed to compare the levels of maternal serum lactate dehydrogenase with the maternal and perinatal outcomes of pre-eclampsia women.

## METHODS

This observational and clinical prospective study was conducted in a tertiary care medical college hospital (Bharati hospital) in Maharashtra during October 2018-October 2020.

### Inclusion criteria

It included 120 consecutive pregnant women with a singleton pregnancy diagnosed with pre-eclampsia (hypertensive disorder of pregnancy).

### Exclusion criteria

Antenatal women with chronic hypertension; pre-existing diabetes mellitus, renal disease, liver disorder, thyroid disorder were excluded from the study.

After obtaining informed and written consent, the detailed history and thorough clinical examination of all participants were done. All women were subjected to routine antenatal investigations. Serum LDH levels were estimated by enzymatic method on the autoanalyzer. Patients were grouped into 3 categories according to serum LDH levels: a) less than 600 IU/l, b) between 600-800 IU/l, c) more than 800 IU/l.

These patients were followed up for the development of premonitory signs and symptoms like epigastric pain, blurred visions, vomiting, and headache. Depending upon the premonitory signs and symptoms, blood pressure, and investigations, they were categorized as mild and severe pre-eclampsia and patients were managed as per hospital protocol.

Observations were recorded about maternal outcomes such as eclampsia/HELLP syndrome/abruptio placenta/ICU admission/intracranial haemorrhage/acute renal failure/pulmonary edema/DIC.

Gestational age wise comparative analysis was done for LDH levels with maternal outcomes. Gestation age groups were as follows: a) 20-28 weeks of gestation, b) 29-34 weeks of gestation, c) >34 weeks of gestation.

## RESULTS

It was observed that patients were uniformly distributed with respect to mean age of patients, parity and mean gestational age among various LDH categories in pre-eclampsia cases. In our study mean age of patients with preeclampsia was 27.98 years with 63.3% cases between 20-30 years of age. In present the study, a total of 39.2% cases of pre-eclampsia were prim gravida while 60.8% were multigravida.

**Table 1: Distribution of study cases as per lactate dehydrogenase (LDH) levels.**

LDH levels (IU/l)	N	Percentage
<600	77	64.2
600-800	20	16.7
>800	23	19.2
<b>Total</b>	<b>120</b>	<b>100.0</b>

It was observed that serum LDH level of more than 800 IU/l was seen in 19.2% while between 600 to 800 IU/l was seen in 16.7% cases (Table 1).

Overall maternal complication rate among cases of pre-eclampsia was 23.4% in the present study. The Most common complication associated with cases of pre-eclampsia was ante-partum haemorrhage (13.3%) followed by development of eclampsia (2.5%). HELLP syndrome developed in 1 case (0.8%). No complication was reported in 76.6% of cases.

Incidence of caesarean section was significantly higher in cases with high LDH levels ( $p < 0.01$ ). Incidence of emergency C-section was 72.7%, 30% and 49.4% in LDH levels of >800 IU/l, 600-800 IU/l and <600 IU/l respectively. A significant association was noted between incidence of maternal complications with high LDH levels ( $p < 0.01$ ). Incidence of maternal complications was 52.5%, 15% and 19.5% in LDH levels of >800 IU/l, 600-800 IU/l and <600 IU/l respectively. High LDH levels were observed to be associated with development of ante-partum haemorrhage, eclampsia and requirement of ICU admission (Table 2). No association was observed between incidence of thrombocytopenia, proteinuria, deep tendon reflex and LDH levels in pre-eclampsia cases ( $p = 0.185$ ).

**Table 2: Association of LDH levels with type of maternal complications.**

Maternal complications	LDH (IU/l)			Total	P value
	<600	600-800	>800		
<b>Haemorrhage (APH/PPH)</b>	9 11.7%	1 5.0%	6 26.1%	16 13.3%	0.09
<b>ICU admission</b>	2 2.6%	0 0.0%	3 13.0%	5 4.2%	
<b>Eclampsia</b>	1 1.3%	2 10.0%	0 0.0%	3 2.5%	0.06
<b>Ascites</b>	0 0.0%	0 0.0%	2 8.7%	2 1.7%	0.01
<b>HELLP</b>	0 0.0%	0 0.0%	1 4.3%	1 0.8%	0.12
<b>LSCS</b>	44 30%	14 42.9%	16 70%	74 61.66%	0.05

## DISCUSSION

Preeclampsia is defined as a syndrome unique to pregnancy that can have a virtual effect on every organ system of the body. It is responsible for systemic endothelial dysfunction which in turn causes vasoconstriction and decreased oxygen saturation (hypoxia) thus resulting in MODS (multiple organ dysfunction syndromes). Multiple studies and researches have been conducted in the past to determine a biochemical marker that can serve as a determinant for prognosis and to assess the severity of preeclampsia for e.g. LDH, homocysteine, serum calcium, calcium/creatinine ratio etc. In this study, complications of preeclampsia in antenatal women and their perinatal outcome are studies with respect to serum LDH levels.

In our study we found that the patients were uniformly distributed with respect to mean age, mean gestational age and parity in various categories of preeclampsia. In research conducted by Nadkarni et al the age group of women with hypertensive disorder of pregnancy was between 21-25 years.<sup>7-9</sup>

### Mode of delivery

Vaginal delivery was possible in only a third of the cases (38.3%) in present study while caesarean section was done in 61.7% cases. In research conducted by Nadkarni et al, the number of LSCS was higher in preeclampsia group than compared to normotensive pregnant women.<sup>9</sup> Kheir et al in their study observed that nearly all cases (98.5 %) were delivered by caesarean section.<sup>8</sup>

### Type of delivery

In the present study, the mean gestation age for delivery was 33.7 weeks with only a third of the cases (34.2%) delivered at term ( $\geq 37$  weeks) and 65.8% delivered preterm.

Nadkarni et al in their study observed that significantly more cases of eclampsia delivered pre-term (61.6%) as compared to controls (24.3%).<sup>9</sup> Similar results were also observed by Kheir et al, where high incidence (52%) of preterm delivery was seen in cases with pre-eclampsia.<sup>8</sup>

### Maternal complications

Overall maternal complication rate among cases of pre-eclampsia was 23.4% noted in the present study correlates with findings from previous studies e.g. Payne et al, studied a total of 2081 cases of Hypertensive disorders of pregnancy (HDP).<sup>8,9</sup> The adverse outcome was observed in 401 (19.26%) of these females. Similarly, in a another study, 12.9 and 18.3% were percentage of adverse outcomes in women with hypertensive disorders of pregnancy respectively.<sup>10</sup>

## CONCLUSION

Thus, to summarize, serum LDH is a reliable biochemical prognostic marker for predicting the prognosis in pregnant women with preeclampsia, for predicting the severity of the disease and the maternal complications associated with it. Hence serum LDH levels must be done in all pregnant women with preeclampsia at their first visit to a health centre.

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