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Original Research Article

Association of Serum Lactate Dehydrogenase Levels in Preeclampsia with Severity of Disease and Fetomaternal Outcome

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Abstract

Background: Pre-eclampsia is responsible for significant maternal and perinatal morbidity and mortality worldwide. Serum LDH level is a useful biomarker to detect the extent of cellular injury in women with pre-eclampsia. Thus it can be used to predict prognosis for both mother and fetus and timely management.

Materials & Methods: This was a hospital based analytical observational study in department of Obstetrics and Gynaecology, SMS Medical College, Jaipur from April 2021 to August 2022 on 250 women with ≥28 weeks gestation with pre-eclampsia.

Results: Mean serum LDH levels were higher in female with pre-eclampsia with severe features as compared to female with pre-eclampsia without severe features($p < 0.0001$). Higher serum LDH levels were found to be associated with poor fetomaternal outcome.

Conclusion: S.LDH levels can be used to predict the prognosis of pre-eclampsia. Women with pre-eclampsia with raised serum LDH levels mandate close monitoring, prompt and correct management to reduce fetomaternal morbidity and mortality.

Keywords: pre-eclampsia, serum LDH, fetomaternal outcome.

INTRODUCTION

Pregnancy is a physiological state associated with many alterations in hematological, biochemical, metabolic and immunological processes[1]. Among high risk category of pregnancy, hypertensive disorders like eclampsia and pre-eclampsia occurs in about 6-8% of all pregnancies and rank one of the major causes of maternal morbidity and mortality[2,3]. These conditions once detected timely are treatable and manageable easily. How pregnancy per say incites or aggravate hypertensive vascular disease remain elusive, despite decades of intensive research, and these disorder remains among the most important unsolved problems in obstetrics.[4] Impaired trophoblastic cell invasion in spiral arterioles of the placenta leading to atherosclerosis and impaired dilatation of vessels is implemented as causative factor of disease[5] .Many other such as immunological intolerance between mother and fetus, genetic predisposition, nutritional imbalance, oxidative stress are also postulated[6,7].Pre-eclampsia is a major obstetric problem leading to substantial maternal and perinatal morbidity and mortality.[8] Its outcome depend on gestational age at the time of onset of disease, severity of disease, quality of management and presence or absence of preexisting medical disorders.

Serum LDH is mainly an intracellular enzyme which is responsible for the conversion of pyruvate to lactate in the cell. [9] In Pre-eclampsia massive cellular death occur which raises this enzyme levels in the serum, thus this is good marker to assess the catastrophic death of cells and severity of Pre-eclampsia. In this study we correlated the levels of serum LDH to severity of pre-eclampsia and fetomaternal outcome as it is rapid and cost-effective marker and can be used as prognostic tool for pre-eclampsia.

Material and Methods

This was a prospective observational study done in department of Obstetrics and Gynaecology, SMS Medical College, Jaipur from April 2021 to August 2022 on women ≥28 weeks' gestation with pre-eclampsia. Women with chronic hypertension,GDM, other medical disorders were excluded from the study. 3 ml of venous blood was drawn under aseptic precaution for selected subjects in plain vial. Serum was separated by centrifugation and used serum levels of lactate dehydrogenase estimated.

Subjects were divided according to serum lactate dehydrogenase levels into followings groups:

a) <600 IU/ L
b) 600-800IU/L
c) >800IU/L

All women were followed till delivery and discharge from the hospital. Maternal and neonatal outcome was assessed in relation to serum lactate dehydrogenase levels. Data was collected and compiled, statistical analysis was done to find the association of S. LDH levels with fetomaternal outcome and severity of disease.

RESULTS

Total 250 women were studied. Women were divided into three groups based on their serum LDH levels and then various fetal and maternal outcome parameters were studied. 146 (58.40%) cases belonged to serum LDH <600 IU/L group, 36 (14.40%) cases belonged to serum LDH 600-800 IU/L group and 68 (27.20%) cases belonged to serum LDH levels >800 IU/L group. Majority of cases were in the age group of 18-29 years. Majority of cases were from urban area and belonged to middle class socio economic status. No significant correlation was found between serum LDH levels and parity.

Table_1: Association of Serum LDH levels with severity of pre-eclampsia.

LDH (IU/L)	Pre-eclampsia Without Severe Features		Pre-eclampsia With Severe Features	
	No.	%	No.	%
<600	146	90.68	0	0.00
600-800	15	9.32	21	23.60
>800	0	0.00	68	76.40

P- Value <0.0001

Table number 1 shows that 146 (90.68%) women with pre-eclampsia without severe features had serum LDH levels <600 IU/L, 68(76.40%) cases of pre-eclampsia with severe feature had serum LDH levels >800 IU/L. The p-value was <0.0001 which was significant. This interprets that with increasing levels of serum LDH severity of pre-eclampsia increases. No significant association was found between age , parity and serum LDH levels.

Table_2: Association of Serum LDH Levels with maternal outcome.

S. LDH IU/L	<600		600-800		>800		
	Mean	SD	Mean	SD	Mean	SD	P value
SBP (mmHg)	145.47	4.98	156.94	9.2	163.97	5.54	0.0001
DBP (mmHg)	94.46	4.99	102.22	7.96	108.97	15.74	0.0001
Urine Albumin (Dipstick)	1.08	0.28	1.81	0.50	2.08	0.51	0.0001
Blood Urea (mg/dl)	16.87	3.94	27.49	6.8	31.55	5.14	0.0001
Serum Creatinine (mg/dl)	0.83	0.06	1.06	6.9	1.12	0.24	0.0001
SGOT (U/L)	52.32	7.38	78.08	18.16	89.38	8.42	0.0001
SGPT (U/L)	52.06	8.58	82.27	16.17	94.76	21.43	0.0001
Mean platelet count(lakh/cumm)	2.80	0.39	2.48	0.26	2.13	0.52	0.0001

In the study women with serum LDH levels <600 IU/L had mean systolic blood pressure 145.47±4.98 mm Hg while women with serum LDH levels between 600-800 IU/ L had mean systolic blood pressure 156.94±9.2 mm Hg and women with serum LDH >800 IU/L had mean SBP 163.97±5.54 mm Hg. p value was 0.0001.(table 2)

Women with serum LDH levels <600 IU/L had mean diastolic blood pressure 94.46+ 4.99 mm Hg while women with serum LDH >800 IU/L had 108.97±15.74 mm Hg . p value was 0.0001

Women with serum LDH <600 IU/L had mean serum creatinine 0.83±0.06 mg/dl while in women with serum LDH levels >800 IU/L 1.12±0.24 mg/dl. p value was 0.0001 which shows that the results are significant.

Women with serum LDH <600 IU/L had mean SGPT 52.06±8.58 U/L while women with serum LDH 600-800 IU/L had mean SGPT 82.27±16.17 U/L and in Women with serum LDH levels >800 IU/L it was 94.76±21.43 U/L . p value was 0.0001.

Women with serum LDH <600 IU/L had mean platelet count 2.80±0.39 lakh/cu mm. Women with serum LDH 600-800 IU/L had 2.48+0.26 lakh/cu mm and in Women with serum LDH levels >800 IU/L mean platelet count was 2.13+0.52 lakh/cu mm. P value was 0.0001.

Table_3: Distribution of Mean S.LDH Levels in Relation to Maternal Complication

Symptom	Number of Cases	Mean LDH	SD
Abruption	3	1010	141.42
DIC	1	1970	205.75
Eclampsia	7	1601.42	448.71.
HELLP	4	1970	153.62
Pulmonary Edema	3	1793.3	167.43
Renal Failure	2	1685	403.05
ICU Admission	2	1065	304.05

Table 3 shows that in women with pre-eclampsia most of the maternal complication occured on higher serum LDH levels. Abruption was seen with mean LDH levels 1010 ± 141.42 IU/L. Mean S.LDH levels were 1601.42 ± 448.71 IU/L in cases with eclampsia and 1970 ± 153.62 IU/L in HELLP. Mean serum LDH levels was 1065±304.05 IU/L in women who needed ICU admission. No maternal death was recorded in our study.

Table_4: Association of Serum LDH Levels with fetal outcome.

	S. LDH IU/L					
	<600		600-800		>800	
	Mean	SD	Mean	SD	Mean	SD
Fetal weight (kg)	2.65	0.34	2.48	0.34	2.43	0.20
Apgar At 1min	7.05	0.71	6.50	0.6	6.13	0.71
Apgar At 5min	7.37	0.99	6.60	0.72	6.10	1.65

In our study women with serum LDH levels <600 IU/L had mean fetal birth weight 2.65 ± 0.34 kg. While in women with serum LDH levels >800 IU/L mean fetal birth weight was 2.43 ± 0.20 kg and the difference was not significant.

In the study babies born to women with serum LDH values <600 IU/L had mean APGAR score of 7.37 ± 0.99 at 5 min and babies born to women with serum LDH >800 IU/L group had mean APGAR of 6.10 ± 1.65 at 5 min. The p-value was <0.001 which was significant.

Table_5: Association of Serum LDH with Perinatal Outcome

Perinatal Outcome	**S. LDH IU/L**					
	<600		**600-800**		**>800**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Alive and Healthy	123	84.25	26	72.22	34	50.00
NICU	23	15.75	9	25.00	26	38.24
Perinatal Mortality	0	0.00	1	2.78	8	11.76
Total	**146**	**100.00**	**36**	**100.00**	**68**	**100.00**

In the present study 123 (84.25%) babies delivered to women with serum LDH levels <600 IU/L were alive and healthy . In women with serum LDH levels >800 IU/L only 34 (50%) babies were alive and healthy, while 26 (38.24%) were

admitted in NICU and 8 (11.76%) expired after birth**.** The correlation was significant with p-value of <0.0001. which means that with increasing levels of serum LDH fetal outcome becomes poorer.

DISCUSSION

In the present study Total 250 women were studied. Majority of women were nulligravida and belonged to younger age group(<30 years). Similar results were observed in the study of Qublan et al. In present study 90.68% women with pre-eclampsia without severe features had serum LDH levels <600 IU/L while 76.40% cases of pre-eclampsia with severe feature had serum LDH levels >800 IU/L. The p-value was <0.0001 which is significant. This interprets that with increasing levels of serum LDH severity of pre-eclampsia increases. Similar observation were noted by Yadav R et al (2019)[10] where 78.87% cases of pre-eclampsia without severe features had serum LDH levels <600 IU/L, 18.3% cases had serum LDH levels between 600-800IU/L and 2.8% cases had serum levels LDH >800 IU/L. 24.40% cases of pre-eclampsia with severe feature had serum LDH levels >800 IU/L, 51.2% cases had serum LDH levels between 600-800 IU/L and 24.4% cases had serum LDH levels <600 IU/L.

Our study shows that with increasing levels of serum LDH levels of SBP and DBP increases. P value was 0.0001.

Similar results were also observed in the study done by Yadav R et al (2019)[10]. In their study mean SBP was 148.76 ± 4.98 mm Hg with serum LDH levels <600 IU/L, and 173.88 ± 19.45 mmHg with serum LDH levels >800 IU/L. Mean DBP was 96.65 ± 14.56 mmHg with serum LDH levels <600 IU/L and 112.12 ± 11.41 mmHg with serum LDH levels >800 IU/L. similar results were also observed in the study of mehta m and jaiswar sp st el.

In the present study it was observed that women with serum LDH levels >800 IU/L had more severe organ damage compared to lower levels in terms of high urine albumin by dipstick, raised blood urea, serum creatinine, high SGOP/SGPT values and low mean platelet count.

Similar results were observed in the study done by Deshmukh VL et al (2020)[11], where women with serum LDH levels <600 IU/L had mean SGPT 22.77 ± 4.71 U/L. Women with serum LDH levels between 600-800 IU/L had mean SGPT 43.14 ± 31.6 U/L and with serum LDH levels >800 IU/L mean SGPT values were 122.15 ± 67.65 U/L.

Similarly Deshmukh VL et al (2020)[11] reported that mean platelet count was 78279.56 ± 12.23/mcl in cases serum LDH < 600 IU/L, 14259 ± 22.43/mcl in cases with serum LDH 600-800 IU/L and 54296.30 ± 129.21 /mcl in cases with serum LDH >800 IU/L.

No significant association was found between fetal birth weight and serum LDH levels.

Few studies showed association of low birth weight of infant with increase in serum LDH levels Gupta A et al (2019)[12], they observed that mean birth weight in women with serum LDH levels <600 IU/L was 2.36 ± 0.60 kg. In women with serum LDH levels between 600-800 IU/L mean fetal birth weight was 2.2 ± 0.52 kg and in women with serum LDH levels >800 IU/L mean fetal birth weight was 1.99 ± 0.59 kg.

In our study babies born to women with serum LDH values <600 IU/L had mean APGAR score of 7.37 ± 0.99 at 5 min and babies born to women with serum LDH >800 IU/L group had mean APGAR of 6.10 ± 1.65 at 5 min. The p-value was <0.001 which is significant.

Similar results were found by Umasatyasri Y et al (2015)[13]. Babies born to women with serum LDH values <600 IU/L had mean APGAR score of 7.32 ± 1.65 at 1 min and 8.73 ± 1.62 at 5 min. While babies born to women with serum LDH levels between 600-800 IU/L had mean APGAR score of 5.57 ± 2.95 at 1 min and 7.73 ± 3.63 at 5 min, babies born to women with serum LDH >800 IU/L group had mean APGAR of 5.27 ± 2.46 at 1 min and 6.10 ± 1.65 at 5 min.

84.25% babies delivered to women with serum LDH levels <600 IU/L were alive and healthy while 72.22% babies delivered to women with serum LDH levels between 600- 800 IU/L were alive and healthy. But in women with serum LDH levels >800 IU/L only 50% babies were alive and healthy, while 38.24% were admitted in NICU and 11.76% expired after birth**.** The correlation was significant with p-value of <0.0001. Which means that with increasing levels of serum LDH fetal outcome becomes poorer due to increased incidence of prematurity, intra uterine growth restriction, low birth weight, neonatal sepsis and placental insufficiency.

Gupta A et al (2019)[12] found similar results in their study. Out of babies delivered to women with serum LDH levels <600 IU/L, 22.64% babies were admitted in NICU and perinatal mortality was 7.54%. 29.62% babies born to mother with serum LDH between 600-800 IU/L were admitted in NICU and 11.11% expired after birth. 50% babies born to mothers with serum LDH levels >800 IU/L were admitted in NICU and 40% expired after birth.

Andrews L et al (2016)[14] reported in their study that 21.5% perinatal death occurred with serum LDH levels <600 IU/L, 28.5% perinatal death with serum LDH levels between 600-800 IU/L and 50% perinatal death occurred with serum LDH levels >800 IU/L.

Perinatal morbidity and mortality had been low in our study as compared to other studies. This is probably due to timely interventions and better neonatal ICU care.

In present study most of the maternal complication occurred in women with serum LDH >800 IU/L. The most common complication was eclampsia and the least was DIC with the highest mean serum LDH levels. The result signifies that with increasing serum LDH values, maternal complications increases and maternal outcome become poorer. Similar results were observed in the study done by Gupta A et al (2019)[12.] The maternal complications were found to be maximum in women with LDH > 800 IU/L. Abruption was the most common complication followed by eclampsia.one maternal death.(5%) was observed in women with LDH levels >800 IU/L and no maternal death was observed in the other two groups. Eclampsia, HELLP syndrome and rate of transfer to ICU was found to be significantly associated with high LDH levels.

CONCLUSION

Serum LDH is the earliest marker in the blood raised during hypoxia and stress. Observation of our study shows that increased levels of S.LDH are associated with severity of pre-eclampsia and had a significant impact on fetomaternal outcome, So S.LDH levels can be used to predict the prognosis of pre-eclampsia. Women with pre-eclampsia with raised serum LDH levels mandate close monitoring, prompt and correct management to reduce fetomaternal morbidity and mortality.

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