THE JOURNAL OF OBSTETRICS AND GYNECOLOGY OF INDIA

The Journal of Obstetrics and Gynecology of India (November–December 2011) 61(6):645–648
DOI 10.1007/s13224-011-0093-9

ORIGINAL ARTICLE

Lactic Dehydrogenase: A Biochemical Marker for Preeclampsia–Eclampsia

Jaiswar S. P. · Gupta Amrit · Sachan Rekha · Natu S. N. · Shaili Mohan

Received: 27 July 2009 / Accepted: 5 August 2011 / Published online: 4 January 2012

Abstract
Objectives To correlate the severity of the disease, maternal and perinatal outcome with Lactic Dehydrogenase (LDH) levels in serum in patients of preeclampsia and eclampsia.
Methods A prospective comparative study was conducted in the department of Obstetrics and Gynecology in the collaboration with department of Pathology, CSM Medical University, Lucknow. Out of 146 women studied, 39 were normal pregnant women, 35 were of mild preeclampsia, 36 of severe preeclampsia and 36 of eclampsia. The statistical analysis was done by Chi-square test (for proportional data) analysis of variance and sample "*t*" test (for parametric data).
Results LDH levels were significantly elevated in women with preeclampsia and eclampsia (<0.001). Higher LDH levels had significant correlation with high blood pressure ($P < 0.10$) as well as poor maternal and perinatal outcome.
Conclusion High serum LDH levels correlate well with the severity of the disease and poor outcomes in patients of preeclampsia and eclampsia.

Keywords Lactic · Dehydrogenase · Preeclampsia · Eclampsia · Maternal outcome

Jaiswar S. P. (✉), Professor · Gupta A., Assistant Professor · Sachan R., Assistant Professor · Natu S. N., Professor · Shaili M., Resident
Department of Obstetrics and Gynecology, Queen Mary Hospital, CSMMU, Lucknow, UP, India
e-mail: spjaiwar@yahoo.com

Introduction

Preeclampsia and eclampsia complicate 6–8% of all pregnancies and lead to various maternal and fetal complications. These are multisystem disorders and lead to a lot of cellular death. LDH is an intracellular enzyme and its level is increased in these women due to cellular death. So, serum LDH levels can be used to assess the extent of cellular death and thereby the severity of disease in this group of women. This can be further used as help in making decision, regarding the management strategies to improve the maternal and fetal outcome.

The aims of the present study are

- To compare serum LDH levels in the normal pregnant women and in women with preeclampsia and eclampsia in ante-partum period.
- To study the correlation of maternal and perinatal outcomes with serum LDH levels.

Methods

This was a prospective comparative study conducted in the department of Obstetrics and Gynecology in collaboration with the department of Pathology CSM Medical University, Lucknow for 1 year.

Pregnant women were enrolled in this study in the third trimester of pregnancy and divided into following groups:

– Group 1—healthy normal pregnant women (controls)
– Group-2—patients of preeclampsia and eclampsia (subjects). This was further subdivided into following subgroups

  (a) Mild preeclampsia
  (b) Severe preeclampsia
  (c) Eclampsia

Subjects were also divided according to the serum LDH levels into following groups:-

(a) <600 IU/l
(b) 600–800 IU/l
(c) >800 IU/l

All women were followed until delivery and early postpartum period and babies till early neonatal period.

Exclusion Criteria

These included mothers with hypertension at/<20 weeks gestation; Preexisting diabetes mellitus, renal disease, liver disorder, thyroid disorder, epilepsy.

Results

Total 146 patients were studied, out of which 39 (26.7%) were normal pregnant women which served as control group; remaining 107 (73.3%) cases included pregnancy with eclampsia and preeclampsia. Out of these 107 cases 35 (32.7%) were mild preeclampsia, 36 (33.6%) were severe preeclampsia and 36 (33.6%) cases were of eclampsia.

The maximum number of patients in control group as well as study group belonged to the age group of 21–30 years. When compared statistically, the age wise distribution in the subjects was almost similar to the control group ($P = 0.920$). Distribution according to parity was similar in both groups (Table 1).

Out of total 58 cases with LDH levels <600 IU/l, 9 (15.52%) had normal SBP, 37 (63.76%) had systolic BP in the range of 140–<160 mm of Hg and 12 (20.69%) had systolic BP 160 and above. Out of 13 patients with LDH levels between 600 and 800 IU/l, 3 (23.08%) had normal systolic BP, 2 (15.38%) had systolic BP in the range of 140–<160 mm of Hg and 8 (61.54%) had SBP 160 or more. In the remaining 36 patients with LDH levels above 800 IU/l, 2 (5.56%) had normal systolic BP, 12 (33.33%) had systolic BP in the range of 140–<160 mm oh Hg and 22 (61.11%) had systolic BP 160 and above.

On the other hand, out of total 58 cases with LDH levels <600 IU/l, 2 (3.45%) had normal diastolic BP, 48 (82.76%) had diastolic BP in the range of 90–<110 mm of Hg and 8 (13.79%) had diastolic BP 110 and above. Out of 13 patients with LDH levels between 600 and 800 IU/l, none had normal diastolic BP, 7 (53.85%) had diastolic BP in the range of 90–<110 mm of Hg and 6 (46.15%) had diastolic BP 110 or more. In the remaining 36 patients with LDH levels above 800 IU/l, 1 (2.78%) had normal diastolic BP, 13 (36.11%) had diastolic BP in the range of 90–<110 mm oh Hg and 22 (61.11%) had diastolic BP 110 and above (Table 2).

On statistical analysis it was found that high diastolic BP was associated with higher levels of serum LDH ($P < 0.001$).

In the control arm all had levels of <600 IU/l, the mean value of LDH being 278.3 ± 119.2 IU/l. Most of the patients in mild preeclampsia group had levels <600 IU/l. Only two patients (5.7%) had LDH in the range of 600–800 IU/l. The mean LDH level calculated as 400.45 + 145.21 IU/l. Out of 36 cases of severe pre-eclampsia, 21 cases (58.3%) had LDH levels <600 IU/l, five cases (13.9) had LDH levels between 600 and 800 IU/l and ten cases (27.7%) had LDH levels above 800 IU/l. The mean

Table 1 Distribution of patients with age and parity

Group	Control	Mild preeclampsia	Severe preeclampsia	Eclampsia	*P* value
Number	39	35	36	36	
Age (mean)	25.46 ± 3.29	25.80 ± 3.30	26.03 ± 3.99	24.50 ± 3.45	0.929
Parity 0 (no.)	18	24	23	28	0.051

Table 2 Association of systolic and diastolic BP with LDH levels in various groups

Groups	LDH level (mean + SD)	Range	*F*	*P*
Control ($B = 39$)	278.33 + 119.25	90–522	13.744	<0.001
Mid preeclampsia ($n = 35$)	400.45 + 145.21	93–795		
Severe preeclampsia ($n = 36$)	646.95 + 401.64	209–1,897		
Eclampsia ($n = 36$)	1648.10 + 1992.29	214–9,163		
Total	903.16 + 1290.29	93–9,163		

Table 3 Association of systolic and diastolic BP with LDH levels in various groups

Groups	<600 IU/l ($n = 58$)	600–800 IU/l ($n = 13$)	>800 IU/l ($n = 36$)	Total ($n = 107$)	P value
Systolic BP (mmHg)					
90–<140	9 (15.52%)	3 (23.08%)	2 (5.56%)	14 (13.08%)	
140–<160	37 (63.79%)	2 (15.38%)	12 (33.33%)	51 (47.66%)	
160 and above	12 (20.69%)	8 (61.54%)	23 (61.11%)	42 (39.25%)	<0.001
Diastolic BP (mmHg)					
60–<90	2 (3.45%)	0	1 (2.78%)	3 (2.8%)	
90–<110	48 (82.76%)	7 (53.85%)	13 (36.11%)	68 (63.55%)	
>110	8 (13.79%)	6 (46.15%)	22 (61.11%)	36 (33.64%)	<0.001

Table 4 Comparison of perinatal outcome with LDH levels

Parameters	<600 IU/l ($n = 43$)	600–800 IU/l ($n = 7$)	>800 IU/l ($n = 11$)	P value
Mean gestational age (weeks)	36.92 ± 3.44	34.77 ± 3.11	35.23 ± 3.23	0.25
Mean baby weight (gm)	2,426 ± 791	1,992 ± 0618	1,979 ± 087	0.019
Apgar score				
At 1 min	6.02 ± 1.28	6.14 ± 1.07	3.91 ± 2.43	<0.001
At 5 min	7.36 ± 0.80	7.29 ± 0.965	5.82 ± 1.54	<0.001
At 10 min	8.02 ± 0.78	7.71 ± 0.95	6.55 ± 1.13	<0.001
Outcome				
Alive and well	47 (83.93%)	5 (38.46%)	14 (45.16%)	<0.001
Neonatal complications	11 (19.64%)	5 (38.46%)	17 (54.84%)	0.003
Neonatal deaths	5 (8.93%)	4 (30.77%)	4 (12.9%)	0.11
Still births	4 (7.14%)	4 (30.77%)	13 (41.94%)	<0.001
Perinatal deaths	9 (16.07%)	8 (61.54%)	17 (54.84%)	0.003

LDH levels were 646.95 ± 401.64 IU/l. In eclampsia group, majority of patients i.e., 25 (69.4%) had levels >800 IU/l. While only 7 (19.4%) had levels between 600 and 800 IU/l and 4 (11.1%) had levels <600 IU/l. The mean LDH level in this group was 1648.10 ± 1992.29 IU/l.

On analyzing the above data it is clearly observed that there is significant rise in the LDH levels with increasing severity of the disease ($P < 0.001$).

Various parameters of peri-natal outcomes in respect to LDH levels, have been studied. The mean gestational age at the time of delivery was 36.92 ± 3.44 weeks in cases with LDH levels <600 IU/l. It was significantly less in patients with LDH level in between 600 and 800 IU/l, which was 34.77 ± 3.11 and 35.25 ± 3.23 in patients with LDH >800 IU/l (Table 3).

It was found that in cases with LDH levels <600 IU/l, the mean baby weight was 2.426 ± 0.791 kg in the group with LDH levels 600–800 IU/l, the mean baby weight was 1.992 ± 0.618 kg. The mean weight in the third group i.e., with LDH levels >800 IU/l was 1.979 ± 0.787 kg. This observation indicates that there is reduction in the average weight of babies with higher level of LDH ($P = 0.019$).

The mean Apgar scores at 1 min ($P < 0.001$) and 5 min ($P = 0.001$) was found to be significantly low in patients with higher LDH levels.

When LDH levels were normal (56 cases), 47 (83.93%) had an uneventful perinatal period. 11 (19.64%) had neonatal complications, while 5 (8.93%) neonatal deaths were reported and there were four cases (7.14%) of still births, i.e., there were 9 (16.07%) perinatal deaths. In the women with LDH levels in the range of 600–800 IU/l (13 cases), five cases (38.46%) had uneventful outcome, while four cases (30.77%) had neonatal death and 5 (38.46%) had neonatal complications. In this group 4 (30.77%) still births were present i.e., there were 8 (61.54%) perinatal deaths. In the third group where LDH levels were markedly elevated (i.e., >800 IU/l) there were 36 cases out of which only 14 had uneventful outcome, whereas 17 cases (58.84%) had neonatal complications and 4 (12.9%) had neonatal death. 13 (41.94%) still births were reported, i.e., there were 17 (54.84%) perinatal deaths.

The occurrence of neonatal complications ($P = 0.003$), stillbirths ($P < 0.001$) and perinatal deaths ($P = 0.003$) were significantly higher in mothers who had increased serum levels of LDH.

When the LDH levels were in the normal range, there were no maternal complications (Table 4) In the second group where LDH levels were moderately elevated (600–800 IU/l) one case of abruption placentae (7.7%) and another case of cerebrovascular accident (7.7%) was noted.

In the third group i.e., with marked elevations of serum LDH levels (>800 IU/l), complications were observed in 8 (22.2%) cases. One case each of abruption placentae, HELLP syndrome with RF, metabolic encephalopathy, pulmonary embolism, pulmonary edema and renal failure and two cases of cerebrovascular accident were present.

There was statistically significant increase in maternal complications with increasing LDH levels ($P < 0.001$).

Discussion

In the present study majority of the patients belonged to younger age group and were nulliparous. This finding was also observed by Qublan et al. [1], where the mean age of normal controls was 30 years and and those with severe preeclampsia was significantly younger with low parity. Systolic and diastolic BP were significantly higher in patients with higher serum LDH levels ($P < 0.001$) in both studies.

Qublan et al. [1] found in their study that the mean LDH levels in normal controls was 299 ± 79 IU/l, in patients with mild preeclampsia was 348 ± 76 IU/l and in patients with severe preeclampsia was 774 ± 69.61 IU/l. Thus they demonstrated a significant association of serum LDH levels with severe preeclampsia ($P < 0.001$). In the present study the LDH levels were significantly raised with the severity of the disease ($P < 0.001$) and this was in accordance with the above study.

The mean gestational age at the time of delivery in the present study was significantly less in patients with increasing LDH levels ($P = 0.025$). This indicates increase in preterm deliveries in patients with higher LDH levels.

The association of low birth weight of infants with increase in serum LDH levels was suggested by He et al. [2] in their study. This was in contrary to Qublan et al. [1] who did not find any significant association. In the present study it was observed that there was significant association of low birth weight and increasing LDH levels ($P = 0.019$). This could partially be due to higher incidence of premature births in this group.

The mean Apgar scores were significantly reduced at 1 min and 5 min, in the present study, showing mild to severe depression of the newborn baby with increasing LDH levels ($P < 0.001$ and $P = 0.001$) for Apgar score at 1 and 5 min respectively.

Increase in the incidence of perinatal deaths was observed by Qublan et al. [1] in patients with increasing levels of serum LDH levels ($P < 0.001$). Intrauterine fetal death was seen in 4.8% of cases, intrauterine growth restriction in 33.9% and prematurity in 77.9%. Neonatal deaths were reported in 95.2% in severe preeclampsia group. Similar findings were obtained in the present study showing significant increase in neonatal complications ($P = 0.0.003$), still births ($P < 0.001$) and perinatal deaths ($P = 0.003$).

Severely pre-eclamptic women with LDH levels of >800 IU/l showed a significant increase in complications in terms of eclampsia, abruption placenta and various other complications compared to women who had lower serum LDH levels, in the study of Qublan et al. [1]. A high serum level of LDH (>1,400 IU/l) were shown to have a high predictive value for significant maternal morbidity in a study conducted by Martin et al. [3] Catanzerite et al. [4] reported a subgroup of patients who had elevated levels of LDH manifested with hemolysis, elevated liver enzymes, low platelet count (HELLP) syndrome and were at a high risk for developing maternal mortality. Demir et al. [5] concluded that there was a statistically significant relation between maternal complications and high LDH levels. It was noted that in early onset severe preeclampsia, LDH levels before delivery were significantly higher in the abruption group Odendaal et al. [6].

Higher serum LDH levels were associated with increased incidence of maternal complications like abruption placenta, renal failure HELLP syndrome, cerebrovascular accidents etc. in the present study. There was a significant increase in maternal morbidity with increasing serum LDH levels ($P < 0.001$). Maternal mortality was 13.8% in patients with LDH levels >800 IU/l and this was a significant rise ($P = 0.006$) which was comparable with other studies.

To conclude LDH levels have significant association with various maternal and fetal outcomes in patients of preeclampsia and eclampsia.

References

1. Qublan HS, Amarun V, Bateinen O, et al. LDH as biochemical marker of adverse pregnancy outcome in severe preeclampsia. Med Sci Monit. 2005;11:393–7.
2. He S, Bremme K, Kallner A, et al. Increased concentrations of lactate dehydrogenase in pregnancy with preeclampsia; a predictor for birth of small for gestational age infants. Gynecol Obstet Invest. 1995;39:234–8.
3. Martin JN Jr, May WL, Magann EF, et al. Early risk assessment of severe preeclampsia: admission battery of symptoms and laboratory tests to predict likelihood of subsequent significant maternal morbidity. Am J Obstet Gynecol. 1999;180:1407–14.
4. Catanzerite VA, Steinberg SM, Mosley CA, et al. Severe preeclampsia with fulminant and extreme elevation of aspartate aminotransferase and lactate dehydrogenase levels. Am J Perinatol. 1995;12:310–3.
5. Demir SC, Evruke C, Ozgunen FT, et al. Factors that influence morbidity, and mortality in severe preeclampsia, eclampsia and HELLP syndrome. Saudi Med J. 2006;27:1015–8.
6. Hall DR, Odendaal HJ, Kirsten GF, et al. Expectant management of early onset, severe preeclampsia perinatal outcome. BJOG. 2000;107:1258–64.