International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Bairwa R et al. Int J Reprod Contracept Obstet Gynecol. 2018 Oct;7(10):3969-3974
www.ijrcog.org

pISSN 2320-1770 | eISSN 2320-1789

DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20183890

Original Research Article

Serum lactate dehydrogenase (LDH) level in mild and severe preeclampsia as a prognostic marker

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Received: 04 September 2018
Accepted: 17 September 2018

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ABSTRACT

Background: Lactate Dehydrogenase (LDH) is mainly an intracellular enzyme. Its level is an useful biomarker for cellular injury which may suggested as a potential marker to predict the severity of preeclampsia and indicator for multi-organ involvement have significant role in management of preeclampsia. We conducted this study to examine the relationship between lactate dehydrogenase concentration and the severity of the disease and occurrence of complications. The objective of the present study was to assess role of serum LDH level in mild and severe preeclamptic women

Methods: This prospective study was conducted in the Department of obstetrics and gynecology in Jhalawar medical college from Jan 2017 to Oct 2017 Total 120 pregnant women during third trimester (32-40 weeks) aged 18 to 35 years were selected. Among them 40 were severe preeclampsia and 40 were mild preeclampsia patients and 40 were healthy normotensive control. Serum LDH level was estimated by continuous spectrophotometric method. Demographic, hemodynamic, and laboratory data were compared among the three groups. The symptoms and complications of severe pre-eclampsia along with foetal outcome were analyzed according to the levels of LDH.

Results: In this study, serum LDH level was significantly higher (P<0.001) in preeclamptic compared to those of control. Again, this value was significantly higher in severe preeclamptic than those of mild preeclamptic. The symptoms and complications of preeclampsia along with perinatal mortality were increased significantly in patents with LDH> 800IU/I compared with those who had lower levels.

Conclusions: From this study, it can be concluded that elevated serum LDH level is associated with severity of preeclampsia. LDH has been evaluated as a biochemical marker for preeclampsia and as a prognosticator of the disease severity. Detection of high-risk patients with increased levels of LDH mandate close monitoring and management to prevent maternal and fetal morbidity and mortality.

Keywords: Maternal morbidity, Maternal mortality, Serum LDH, Severe preeclampsia

INTRODUCTION

Pregnancy is a physiological state associated with many alterations in metabolic, biochemical, physiological, hematological and immunological processes. If there are no complications, all these changes are reversible following a few days to a few months after delivery.[1] Hypertension during pregnancy is a major health problem. Preeclampsia (PE) is a theoretical disease with a pathogenesis that is not clearly understood yet. Lately vascular system pathology and vasoconstriction have been blamed as causes for preeclampsia. Preeclampsia is a condition of hypertension (> 140/90 mm Hg) associated with proteinuria and oedema in pregnant women after the 20th gestational week and most frequently near term.[1]

Preeclampsia can be categorized in to mild and severe forms.[2] Mild preeclampsia is defined as onset of

hypertension after 20 weeks of gestation with systolic blood pressure of >140 to <160 mmHg or a diastolic blood pressure >90 to <110 mmHg in combination with proteinuria >0.3gm to <5gm per day.

Severe preeclampsia is diagnosed when systolic blood pressure is greater than 160 mmHg or diastolic blood pressure is greater than 110 mmHg and associated with proteinuria greater than or equal to 5 gm per day. Severe preeclampsia is accompanied by thrombocytopenia, pulmonary oedema, or oliguria.[2-3]

Preeclampsia is a major cause of maternal and perinatal morbidity and mortality.[4] Preeclampsia virtually affects all maternal organ system including liver, kidneys, brain, clotting system and primarily the placenta.[5-6] Defective placentation and endothelial dysfunction are considered as the core features of preeclampsia.[7-8]

Literature review suggested that in preeclampsia the progressive endothelial dysfunction in maternal vascular system induced by toxins released from hypoxic placenta causes profound vasoconstriction affecting all organ system including liver.

This hypo-perfusion induced ischemic injury to the hepatic cells and other organs causes increased release of cellular LDH into serum and also paranchymal necrosis of liver causes elevation of hepatic enzymes (AST and ALT>70 IU/L, LDH>600IU/L).[9] Lactate dehydrogenase is an intracellular enzyme and its elevated blood level indicates cellular death followed by its leakage to circulation.[6,10] Recently, LDH level has been suggested as potential markers to predict the severity of preeclampsia and indicator for multiorgan involvement.[6]

Several studies reported that serum LDH level increases with severity of preeclampsia and showed significant correlation with high blood pressure and poor maternal and perinatal outcomes. In their study, the symptoms and complications of preeclampsia along with perinatal mortality were significantly increased in patients with serum LDH > 800 IU/L.[5-6,8,10]

Moreover, the serum LDH was found a good predictor of the severity of pregnancy induced hypertension (PIH) and bad foetal outcome. But some researchers did not find significant difference of serum LDH level between preeclamptic women and healthy pregnant women.[11-12] Therefore, the present study has been designed to assess the serum LDH level in pregnant women with mild and severe preeclampsia.

METHODS

This prospective study was conducted in the Department of obstetrics and gynecology in Jhalawar Medical College from Jan 2017 to Oct 2017. All of the subjects were selected from Department of Obstetrics and Gynecology of Jhalawar Medical College Hospital Rajasthan by simple random sampling. After selection the nature, purpose, benefit and risks of the study were explained in detail. Informed written consent was taken from the participants. Before taking blood, detailed family and medical history were taken and recorded in a prefixed data schedule.

Serum LDH level was estimated by continuous spectrophotometric method. Presence of proteinuria was determined by conventional heat coagulation test. Then interpretation of the heat coagulation test result was done according to presence of turbidity in the urine as nil/ trace (0), 1+, 2+, 3+ and 4+.

Inclusion criteria

- Singleton pregnancy
- Age 18-35 years,
- Preeclamptic women whose blood pressure was normal during first 20 weeks of gestation
- No previous history of hypertension and all the case were in the third trimester of pregnancy.

Exclusion criteria

- Patients with diabetes, renal failure, haemolytic anemias, chronic hypertension, gestational diabetes, multiple pregnancy, smoking and alcoholism, liver disease, hepatotoxic drugs, stroke, coronary artery disease, chronic lung diseases, connective tissue disorders, disseminated intravascular coagulation and seizures, were excluded.

Statistical analysis

Sample size included total of 120 pregnant women during third trimester (32-40 weeks) aged 18 to 35 years were selected. The patients were divided into three groups: group I (n=40) - third-trimester healthy pregnant women, group II (n=40) women with mild pre-eclampsia, and group III (n=40) patients with severe pre-eclampsia.

The three groups were matched according to age, gravidity, parity, maternal weight, and hemodynamic and laboratory results. Because levels of LDH <600 IU/l are common in normal pregnancy and only levels>600 IU/l were reported to be associated with complicated pre-eclampsia. Stastical analysis of data is done by help of SPSS 20.0 Software (trail version). Chi square test, Unpaired –T test, Correlation and One-way ANOVA test is use in data analysis.

RESULTS

In present study the total 120 patients were taken, divided into 3 groups, each group containing 40 patients. The groups were divided into severe pre-eclampsia, mild preeclampsia and 40 patients who were not having increased bp or proteinuria were allocated to control group. The age group which we took for our study was

between 18 to 35years.The mean age for severe pre-eclampsia was 23.6000±3.09.The mean age for mild pre-eclampsia was 24.2500±2.98, and the mean age for control group was 24.8000±3.74.The P value was 0.268 which is more than 0.05 so the null hypothesis was not rejected .so there was no significant correlation found between age and preeclampsia.

Table 1: Distribution of age according to the groups.

	N	Mean age	Std. deviation	F value	P value
Severe pre-eclampsia	40	23.6000	3.09507		
Mild pre-eclampsia	40	24.2500	2.98501	1.332	0.268
Normal	40	24.8000	3.74303		
Total	120	24.2167	3.30058		

In present study total 120 patients were taken according to parity , divided into 7 groups which are G2A1, G2P1L0, G2P1L1, G3P2L1, G3P2L2,G4L3P3 and primigravidas group for which (N=1,2,20,1,6,1,89) (0.80%, 1.70%, 16.70%, 0.80%, 5.00%, 0.80%, 74.20%) chi square value is 15.606 and P value is 0.210 which is more than 0.05 so null hypothesis was not rejected so there is no significant correlation found between parity and preeclampsia.

The total 120 patients who were divided into 3 groups i.e. severe, mild preeclampsia and control group. the patients were allocated to each group according to their mean bp. The severe preeclampsia group was having a mean bp of 170.35±10.56, the mild preeclampsia group was having bp of 144.5000±6.05, the control group was having a mean BP of 113.6500±7.28.

Table 2: Distribution of parity according to the groups.

	Group			Total	Chi sq	P value
Parity	Severe pre-eclampsia	Mild pre-eclampsia	Normal			
G2 A1	0	1	0	1	15.606	0.210
	0.00%	2.50%	0.00%	0.80%		
G2P1L0	1	1	0	2		
	2.50%	2.50%	0.00%	1.70%		
G2P1L1	3	8	9	20		
	7.50%	20.00%	22.50%	16.70%		
G3P2L1	1	0	0	1		
	2.50%	0.00%	0.00%	0.80%		
G3P2L2	0	2	4	6		
	0.00%	5.00%	10.00%	5.00%		
G4P3L3	0	0	1	1		
	0.00%	0.00%	2.50%	0.80%		
Primi	35	28	26	89		
	87.50%	70.00%	65.00%	74.20%		
Total	40 100.00%	40 100.00%	40 100.00%	120 100.00%		

Table 3: Distribution of blood pressure according to groups.

	N	Mean BP	Std. deviation	F value	P value
Severe Pre-eclampsia	40	170.3500	10.56251		
Mild Pre-eclampsia	40	144.5000	6.05932	480.203	<0.0001
Normal	40	113.6500	7.28733		
Total	120	142.8500	24.65311		
Severe Pre-eclampsia	40	113.8250	5.37748		
Mild Pre-eclampsia	40	94.9000	6.12603	466.393	<0.0001
Normal	40	74.4500	5.77328		
Total	120	94.3917	17.12892		

The systolic blood pressure was significantly higher in severe preeclampsia followed by mild preeclampsia and normal patients. The diastolic blood pressure also shows similar results. In present study the total 120 patients were taken, divided into 3 groups, each group containing 40 patients. The groups were divided into severe pre-eclampsia, mild preeclampsia and 40 patients who were not having increased B.P or proteinuria were allocated to

control group. The mean urine albumin for severe pre-eclampsia was 1.4725±0.25. The mean urine albumin for mild pre-eclampsia was 0.3925±0.18, and the mean urine albumin for control group was 0.1530±0.60. The mean uric acid for severe pre-eclampsia was 6.8700±0.86. The mean uric acid for mild pre-eclampsia was 4.6750±1.21, and the mean urine albumin for control group was 3.1690±0.33.

Table 4: Distribution of urine-albumin and uric-acid according to groups.

	N	Mean	Std. deviation	F value	P value
Severe pre-eclampsia	40	1.4725	0.253174		
Mild pre-eclampsia	40	0.3925	0.18727	563.969	<0.0001
Normal	40	0.1530	0.7730		
Total	120	0.6727	0.60552		
Severe pre-eclampsia	40	6.8700	0.86029		
Mild pre-eclampsia	40	4.6750	1.21903	177.656	<0.0001
Normal	40	3.1690	0.33707		
Total	120	4.9047	1.7594		

Table 5: Distribution of LDH according to the groups.

	N	Mean Serum LDH	Std. Deviation	F value	P value
Severe pre-eclampsia	40	550.1000	518.17892		
Mild pre-eclampsia	40	445.8500	65.99167	53.975	<0.0001
Normal	40	243.8750	43.97213		
Total	120	413.2750	184.27400		

Table 6: Distribution of mode of delivery according to groups.

	Group			Total	Chi sq
Mode of delivery	**Severe pre-eclampsia**	**Mild pre-eclampsia**	**Normal**		
LSCS	21	11	4	36	
	52.60%	27.50%	10.00%	30.00%	
NVD	10	29	36	84	17.381
	47.50%	72.50%	90.00%	70.00%	
Total	40	40	40	120	

So, the women with severe pih showed statistically significant increase in terms of urine albumin (P <0.0001) And uric acid (P<0.0001). The mean serum LDH for severe pre-eclampsia was 550.1000 ±5181.17. The mean Serum LDH for mild pre-eclampsia was 445.8500±65.99, and the mean serum for control group was 243.875±43.97. Hence, Women with severe pih showed statistically significant increase in terms of Serum LDH (P <0.0001). Out of 120 patients which were divided into severe preeclampsia, mild preeclampsia and control group ;36 patients underwent caesarian section and 84 had normal vaginal deliveries but out of 36 caesarian sections 21 were from severe preeclampsia group,11 from mild preeclampsia group and 4 from control group.

Table 7: Distribution of LDH and birth weight in severe pre-eclampsia groups.

	Mean	Std. Deviation	N	r value	P value
Birth Weight	1.9125	0.46585	40		
Serum LDH	550.1000	218.17892	40	-0.585	<0.0001

In our study we found there was number of Caesarean sections more than normal vaginal delivery in severe preeclampsia in comparison to mild preeclampsia and normal patients. (P value=0.0001 which is less than 0.05 so null hypothesis was rejected so there is significant correlation found between severity of preeclampsia and

rate of cesarean section.). The distribution of LDH and Birth weight was analysed in a severe preeclampsia group of 40 patients(N=40) and it was found that with increase in serum LDH values there was decrease in birth weight. Hence In present study we found there is a negative correlation between birth weight and serum LDH level in severe preeclampsia (r value=-0.585). (P value <0.0001).

Table 8: Distribution of according to the groups.

	Perinatal death	N	Mean serum LDH	Std. deviation	T value
Serume LDH	Present	10	749.8000	105.09445	3.905
	Absent	30	483.5333	205.55572	

In present study out of 40 patients which belonged to the severe preeclampsia group ,10 perinatal deaths occurred and, in these patients, mean serum LDH levels were found to be higher (mean serum LDH=749.8000±105.094) as compared to other 30 patients having lower mean LDH values (mean serum LDH =483.5333±205.55). (T value=3.905,P value <0.0001 which is less than 0.05 , thus significant correlation is found between perinatal death and serum LDH values).

DISCUSSION

In present study, we observed a significant rise in the LDH levels with increasing severity of the disease (P <0.0001-statistically significant). Mean LDH level in control is 243.87±43.9, mean LDH level in mild preeclampsia is 445.85±66 and in severe preeclampsia is 550.1±218.17. Study by Qublan HS et al also demonstrated a significant association of serum LDH levels with severe preeclampsia (P <0.001).[11]

In another study by Jaiswar SP et al mean LDH levels of control group was 278.3±119.2 IU/l (normotensives),13 in mild preeclampsia group it was 400.45 + 145.21 IU/l and in severe preeclampsia group it was 646.95±401.64 IU/l. There is reduction in the average weight of babies with higher level of LDH. This indicates increase in preterm deliveries in patients with higher LDH levels in the present study. This is in accordance with the study done by Umasatyasri Y et al.[14]

In the present study, increased serum LDH level in preeclamptic women than control women are attributed to these facts. Moreover, the progressively increased LDH level in severe preeclampsia indicates progression of cellular injury with severity of this disorder. Moreover, in our study we found there was number of Caesarean sections more than normal vaginal delivery in severe preeclampsia in comparison to mild preeclampsia and normal patients. (P value=0.0001 which is less than 0.05 so null hypothesis was rejected so there is significant correlation found between severity of preeclampsia and rate of cesarean section), and more perinatal deaths occurred in patients with higher LDH values.

CONCLUSION

From the results of this study, it can be concluded that elevated serum LDH level is associated with severity of preeclampsia. In the present study, LDH has been evaluated as a biochemical marker for preeclampsia and as a prognosticator of the disease severity. Detection of high-risk patients with increased levels of LDH mandate close monitoring and management to prevent maternal and fetal morbidity and mortality.

ACKNOWLEDGMENTS

Authors would like to express gratitude to the participants of the study and to the authorities of Jhalawar Medical College for their kind permission to carry out the study. Special thanks to DR U. S. Shukla (Associate Professor, Statistics).

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Bairwa R, Iqbal S, Serum lactate dehydrogenase (LDH) level in mild and severe preeclampsia as a prognostic marker. Int J Reprod Contracept Obstet Gynecol 2018;7:3969-74.