ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 16, Issue 10, 2023

Online - 2455-3891
Print - 0974-2441

Research Article

ASSOCIATION OF SERUM LACTATE DEHYDROGENASE AND GAMMA-GLUTAMYL TRANSFERASE WITH PRE-ECLAMPSIA

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Received: 17 April 2023, Revised and Accepted: 30 May 2023

ABSTRACT

Objectives: Pre-eclampsia produces potentially lethal complications including placental abruption, hepatic failure, acute renal failure, and cardiovascular collapse. The present study was planned to find the association between serum lactate dehydrogenase (LDH) and gamma-glutamyl transferase (GGT) with pre-eclampsia and compare it with normal healthy control.

Methods: This hospital-based case–control study was conducted in the biochemistry department in collaboration with the Department of Gynaecology, Sardar Patel Medical College, Bikaner (Raj). 50 subjects to find whether there are any changes in the levels of serum LDH and GGT in pre-eclamptic patients (case group) compared to that of 50 normal pregnant women (control group).

Results: The present study has shown statistically significant ($p<0.001$) increases in serum LDH levels and GGT in pre-eclamptic patients compared to control subjects.

Conclusion: Serum LDH and GGT screening in early pregnancy may be helpful in predicting the occurrence of pre-eclampsia.

Keywords: Gamma-glutamyl transferase, Lactate dehydrogenase, Pre-eclampsia.

 DOI: http://dx.doi.org/10.22159/ajpcr.2023v16i10.48107. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Pre-eclampsia is a clinical manifestation that occurs after the 20th week of pregnancy and is characterized by hypertension, proteinuria, and edema. It is a multisystem pregnancy condition with potentially serious effects for both mother and child [1]. Pre-eclampsia has been linked to vascular dysfunction. Many biochemical indications of vascular dysfunction have been studied in maternal blood. It has also been shown that oxidative stress in preeclampsia can cause vascular damage and worsen the condition [2]. Lactate dehydrogenase (LDH) and gamma-glutamyl transferase (GGT) have been established in numerous studies to be helpful indicators of preeclampsia and eclampsia [3]. GGT is an ectoenzyme that is found in numerous tissues throughout the body, particularly the liver. Significant activity occurs at the cellular level in both the endothelium and the epithelium. GGT has long been employed as a marker for alcohol consumption, and its physiological relevance has recently been thoroughly researched. According to certain experimental research, GGT is implicated in the formation of free radicals and, even when functioning normally, may be an early sign of oxidative stress [4]. LDH is an internal enzyme that converts lactic acid to pyruvic acid, and high levels suggest cellular death and enzyme leakage [5]. The most commonly measured enzymes are serum LDH and serum GGT to evaluate the presence of tissue damage associated with endothelial damage. Dysfunction of endothelial cells can contribute to inappropriate vasoconstriction and platelet aggregation which are early signs of hypertension [6]. The analysis of a combination of biomarkers particularly markers related to vascular dysfunction such as LDH may enrich the ability to predict and prevent preeclampsia in the near future [7]. Hence, the present study is aimed at comparing the LDH and GGT levels in normotensive and pre-eclamptic women.

METHODS

The study was conducted in the Department of Biochemistry in collaboration with the Department of Gynaecology, S.P. Medical College, and the associated group of PBM Hospital, Bikaner, Rajasthan. 100 subjects aged between 20 and 35 years were selected for this study. The subjects of the study were divided into two groups. The subjects were pre-eclamptic pregnant women in the third trimester with an age range of 20–35 years. Patients with a past history of renal disease, coronary artery disease, chronic hypertension, and gestational diabetes mellitus were excluded. Women with normal pregnancy with similar maternal and gestational ages were taken as a control. All were in the same previously mentioned criteria but did not develop hypertension during the 3rd trimester. They were all normotensive with a systolic blood pressure of 130 mmHg or less and a diastolic pressure of 80 mmHg or less. After the approval of the institutional ethical committee, the study was done. Informed consent was obtained from each participant before their recruitment.

After an overnight fast of 10–12 h, 5 mL of venous blood sample was collected from the subject from the antecubital vein using an aseptic technique. Serum LDH and GGT biochemical parameters were estimated using a fully automated chemistry analyzer. The blood pressure was measured by the sphygmomanometer while the patient was lying on a couch on her side. Serum LDH was estimated by P→L UV-kinetic method and GGT was estimated by the Glupa-C kinetic method.

Statistical analysis

Data were entered in a Microsoft Excel sheet and exported and analyzed using Statistical Package for the Social Sciences version 15.0 software. The results were expressed as mean ± standard deviation. The value of significance was evaluated with a p-value.

RESULTS AND DISCUSSION

The present study was done on 50 patients who were suffering from pre-eclampsia and compared with 50 controls. All subjects were in their third trimester and subjects of the control group and study group

Table 1: Distribution of groups according to gestational age

Gestational age (weeks of gestation)	Normal pregnant women (control subjects) (n=50)		Normal pregnant women (study subjects) (n=50)	
	Number	Percentage	Number	Percentage
29–32	03	06	02	04
33–36	14	28	13	26
37–0	33	66	35	70
Total	50	100	50	100

Table 2: Comparison of LDH in control and study group

LDH	Control group	Study group
Mean	354.64	593.58
SD	50.95	91.35
Range	255–445	368–786
SEM	7.205	12.92
t value	16.153	
p<value	0.0001	

p<0.0001: Significant, LDH: Lactate dehydrogenase, SD: Standard deviation, SEM: Standard error of the mean

Table 3: Comparison of GGT levels in control and study group

GGT	Control group	Study group
Mean	23.84	50.90
SD	7.01	8.53
Range	9–37	16–70
SEM	0.991	1.206
t value	17.330	
p<value	0.0001	

p<0.001: Significant, GGT: Gamma-glutamyl transferase, SD: Standard deviation, SEM: Standard error of the mean

were almost in the same gestational age groups. Hence, the gestational age factor was ruled out to have any effect which may influence the metabolism of serum LDH and GGT. Most of the study participants have a gestational age of week 37 in both groups, as shown in Table 1.

The mean serum LDH level was found to be 354.64±50.95 IU/dL in control subjects. The serum LDH levels increased to 593.58±91.35 IU/dL in pre-eclamptic pregnant women (study subjects). Similar findings of Gupta *et al*. [8] and Talwar *et al*. [9] are depicted in Table 2. The increase was statically significant as compared to that of normal pregnant women (control group) as evident by p-value which is <0.0001 (p<0.0001). The present study's results resembled the findings of Umasatyasri *et al*. [10].

The study observed that serum LDH might be a cause of the development of pre-eclampsia. This may be due to endothelial dysfunction caused by factors released from the ischemic placenta may be a causative factor for disease pathogenesis. LDH enzymes have an important role in cellular respiration, the process by which glucose from food is converted into usable energy for cells. Elevated levels of LDH indicate tissue damage, the main reason for the occurrence of pre-eclampsia, abruption, intracranial hemorrhage, and HELLP syndrome as reported by Hak *et al*. [11], suggesting a similar relationship between serum LDH and the incidence of pre-eclampsia [12,13].

In Table 3, the mean serum GGT level was found to be 23.84±7.01 IU/dL in control subjects as compared to 50.90±8.53 IU/dL in pre-eclamptic pregnant women (study subjects). Similar results were obtained by Munde *et al.* (2014) [14]. The increased value of GGT in pre-eclamptic pregnant women was statistically significant as compared to that of normal pregnant women (control group) as evidenced by a p=0.0001 (p<0.0001) seen in the findings of Talwar *et al*. [9]. The data of the present study show that serum GGT is one of the causes of the development of preeclampsia, during pregnancy. The increased levels

Table 4: Comparison of LDH with GGT in case and control group

Groups	LDH	GGT	p<value
Case	593.58±91.35	50.90±8.53	<0.001
Control	345.64±50.95	23.84±7.01	<0.46

p<0.001: Significant, GGT: Gamma-glutamyl transferase, LDH: Lactate dehydrogenase

of GGT have an increased risk of death, major vascular and non-vascular outcomes, hypertension, and diabetes. GGT is also known to be involved in the generation of free radicals and causing oxidative stress, reported by Nemesánszky and Lott [15].

Table 4 depicts the mean association between serum LDH

and serum GGT level in the study subjects 593±91.35 IU/dL with a range of 368 to 786 IU/dL and 50.90±8.53 with a range of 16–70, done by Gupta *et al*. [8] and Sarkar and Sogani [16]. The result was statistically significant as compared to that of LDH and GGT in pre-eclamptic women (p<0.001), similar findings of Hak *et al*. [11].

CONCLUSION

Our study recorded a statistically significant increase in serum LDH levels and GGT in pre-eclamptic patients compared to control subjects. Endothelial dysfunction caused by factors released from the ischemic placenta may be a causative factor for disease pathogenesis. Serum LDH and GGT could help in the early detection of pre-eclampsia, also act as predictive markers, and deal with adverse complications of preeclampsia.

ACKNOWLEDGMENT

We would like to thank all those who participated in the preparation of this manuscript. We are very grateful to Mr. Ram senior technician and Dr. Amit a Statistician for their support in data collection and analysis. Special thanks go to all members of staff in the Department of Biochemistry for their cordial help.

AUTHORS CONTRIBUTIONS

The manuscript writing had accomplished by Neetu Kumari and the data collection and analysis were done by Neetu Kumari and Jyoti. The research was reviewed and edited by Jaswant Kaur and statistical analysis was done by Neha Suthar Dr. R.K. Vyas. Jaswant Kaur and Dr. RK Vyas finalized and submitted the manuscript for publication.

CONFLICTS OF INTEREST

The authors affirm no conflicts of interest.

AUHTORS FUNDING

None.

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