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Determination of Gamma Glutamyltransferase and Lactate dehydrogenase among Sudanese women with preeclampsia

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Abstract
Objectives
The main objective of this study is to determine the association of serum Lactate Dehydrogenase (LDH), γ-glutamyltransferase (GGT) levels, and progression of Preeclampsia. (PE).
Materials and method
This is a case-control study, was conducted at Maternity Hospital, Police Hospital, and Port Sudan Hospital, Red Sea State, Sudan, from January/2017 to August 2017. The study enrolled 100 women divided into normal Control group (n = 40), and Case group included 60 women with PE (38 mild cases, and 22 severe cases). Estimation of serum LDH and GGT levels were measured by using the Spectrophotometric method using BioSystems reagents (BioSystems S.A. Costa. Brava,30.08030. Barcelona, Spain).
Results
In comparison to the controls, women with preeclampsia had a significantly increased level of LDH (665.00±293.007 IU/L than in normal pregnant women 226.37±22.928 IU/ L, P.value = 0.000), and the mean level of GGT was increased in women with preeclampsia (18.22±6.662IU/L when compared with control 11.78±1.776 IU/L, P.value 0.000).
Conclusion
This study revealed a significant increase in LDH and GGT levels which may reflect the severity of preeclampsia. Therefore, LDH and GGT are useful markers for the monitoring and follow-up of preeclampsia cases to eliminate the maternal morbidity and mortality cases.
Keywords: *GGT; LDH; Preeclampsia; Sudan.*

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I. Introduction

Preeclampsia is one of the most significant pregnancy complications .The principal criterions regarding PE are hypertension then proteinuria particularly after 20 weeks of gestation. PE can be categorized into mild PE diagnosed when (systolic blood pressure ≥ 140 to < 160 mmHg and diastolic blood pressure ≥90 to <110 mmHg, with proteinuria ≥0.3gm to < 5gm per day, and severe PE detected when (systolic blood pressure ≥160 mmHg or diastolic blood pressure ≥110 mm Hg, together with proteinuria greater than or equal to 5 gm per day [1,2,3]. PE is common disorder affecting about 3% –14% of all pregnant women worldwide and responsible for the high risk numbers of maternal and fetal morbidity and mortality globally [4,5]. PE approximately responsible for up to 4% of all maternal morbidity and mortalities in the areas over sub-Saharan Africa [6, 7]. In Sudan, PE accounts around 4.2% of all obstetric complications, and responsible for 18.1% of the maternal mortality cases [8,9]. PE Known as a multisystem disease that involves several organs in the body such as liver, kidneys, brain, and coagulation system [10,11]. Regarding the etiology of PE is still

obscured but supposed to be related to some defects like abnormal placental implantation, endothelial dysfunction, genetic clotting disorders [12-15]. Many studies have shown that LDH activity are higher in the placentas of PE than normal pregnancy [16,17]. The increase levels of the LDH in PE is mainly suggested being due to hypoxia which enhance the glycolysis process, and eventually leads to several cellular deaths. Thus, the estimation of serum LDH level can be used as a diagnostic marker to assess the degree of cellular death and then the severity of PE [18-20]. GGT is widely distributed substance throughout the human body including many tissues, particularly liver. Regarding the cellular level, the substantial activity of GGT occurs in both endothelium and epithelium [21]. Increased levels of GGT have been reported in some cases such as non-pregnant hypertensive patients, and stroke patients, which were supposed to be due to vascular endothelial damage [22, 23]. The current study hypothesizes that elevated levels of serum LDH and GGT may reveal the severity of PE and then explore the complications. In Sudan not many studies have been reported on the correlation between LDH, GGT and the severity of PE. Therefore, the main objective of this study is to determine the correlation of serum LDH, GGT levels and the severity of PE.

II. Materials And Methods

This study is a case-control hospital based study, conducted at the Department of Obstetrics & Gynecology, Maternity Hospital, Police Hospital, and Port Sudan Hospital, Red Sea State, Sudan, from January/2017 to August 2017. The study enrolled 100 participates were divided into two groups: Case group included 60 women with PE subdivided into mild cases (n =38) when their blood pressure was ≥ 140/90 mmHg and a proteinuria ≥300 mg, and severe cases (n=22) when blood pressure increased to at least 160/110 mm Hg and ≥5 g proteinuria.

Inclusion and exclusion criteria: Pregnant women with PE and normal pregnant women after 20 weeks of gestation were included in this study. Pregnant women with a history of chronic hypertension, cancer, kidney disease, heart disease, diabetes, and gestational diabetes, liver disease, taking some drugs, such as corticosteroids, anticoagulant therapy are excluded from the study.

Specimen collection:

Sample size of the 100 women of this study (60 case and 40 control) was calculated by using OpenEpi Epidemiologic Calculator Version 3.01, the sample size provided 80% power to detect a 5% difference at $\alpha = 0.05$, assuming that 10% are nonresponsive women. Medical history and obstetrics information were collected by using a structured questionnaire. Serum specimen obtained by collection of 3 ml of venous blood from all the participants under septic conditions, then centrifugation for 5 minutes at 3000 rpm. Serum samples are stored at (-20 °C) until the estimation time of LDH and GGT by Spectro photometric method, using Bio Systems reagents (Bio Systems S.A.Costa.Brava,30.08030.Barselona,Spain

Data analysis: Data were entered and analyzed using the statistical package for social sciences (SPSS-version-16) on a programmed computer. The mean standard deviations of the variable were calculated for both the test group and the control group. t-test was used to compare between the two groups (cases and controls). Data was expressed as mean ± S. D, and the results were showed inform of tables and figures. The Pearson's correlation coefficient (Pearson's r) and linear regression were used to access the correlations between different variable. A p. value ≤ 0.05 was considered statistically significant.

III. Results

This study including100 participates, 60 Pregnant women with PE distributed as (38 were mild PE and 22 severe case of PE), and 40 normal pregnant women as control. In the case group age range was from 19-36 years (mean 26.28 ± 4.434). The age range of control group was 17-33 years (mean 23.73 ± 3.789). Our results showed an insignificant correlation between LDH (P.value 0.845, R-value 0.026), GGT (P.value = 0.916, R-value = 0.014) and Age in PE group. The result also showed an insignificant correlation between LDH (P.value 0.520, R-value 0.085), and GGT (P.value = 0.402, R-value = 0.110) and gestation age/ weeks in PE group. The results revealed a significant elevation of GGT and LDH enzymes in case group than in control group as presented in **Table 1.** As shown in **Table 2** there is a significant in the mean of GGT and LDH between severe and mild cases of PE groups. The results showed a positive correlation between GGT and diastolic blood pressure in mild and severe cases of PE as illustrated in **Figure 1,2**. It was also found positive correlation between LDH and diastolic blood pressure in mild and severe cases of PE **Figure 3,4.**

Table 1: Showed a significant difference of GGT and LDH among PE than control

Parameter	PE Mean± (SD)	Control Mean± (SD)	P-value
GGT (IU/L)	18.22± (6.662)	11.78± (1.776)	0.000
LDH (IU/L)	665.00± (293.007)	226.37± (22.928)	0.000

Table 2: Reveals the mean differences of GGT and LDH between severe and mild cases of PE.

Parameter	Mild PE Mean±(SD)	Severe PE Mean±(SD)	P value
GGT(IU/L)	14.11± (3.494)	25.32± (4.444)	0.000
LDH(IU/L)	485.71± (68.330)	974.68± (272.661)	0.000

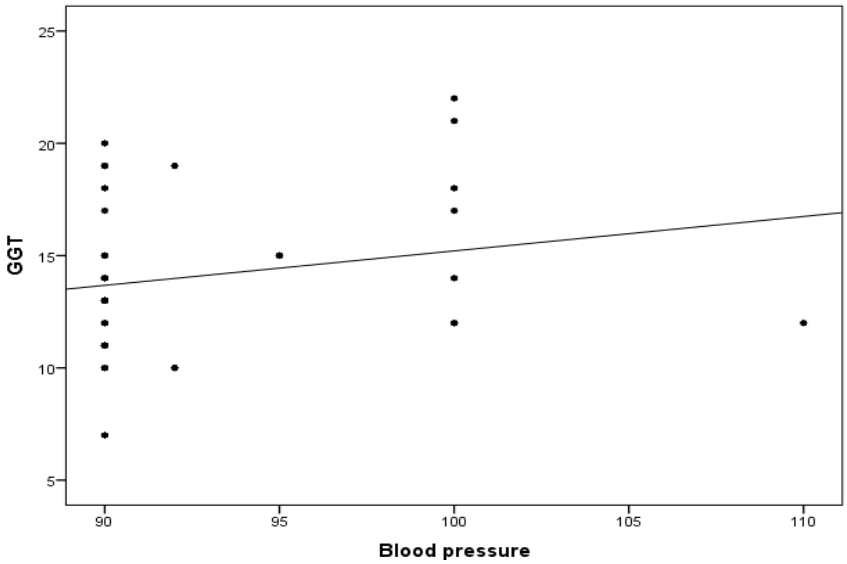

Figure 1: Insignificant positive correlation between GGT and diastolic blood pressure in mild PE group.
R .value = 0.212
P .value = 0.200

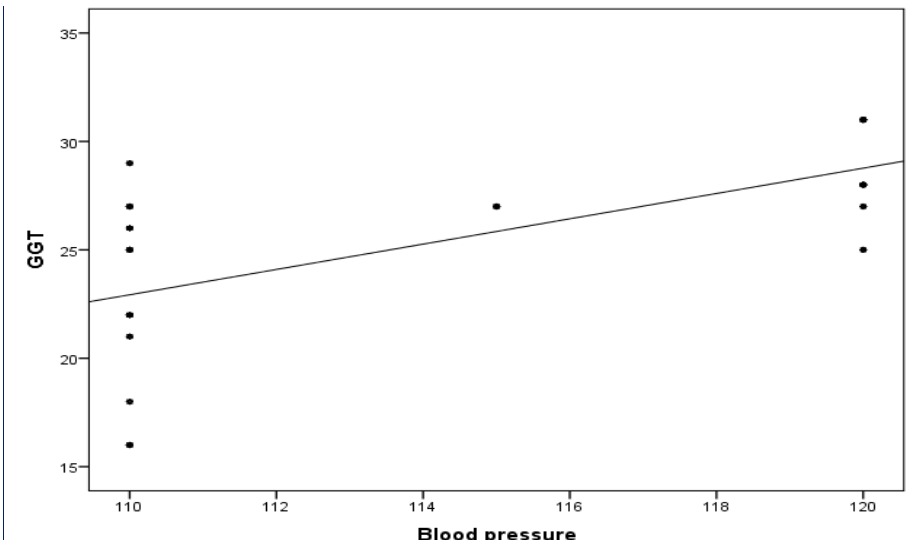

Figure 2: Positive correlation between GGT and diastolic blood pressure in severe PE group.
R value = 0.598
P .value = 0.000

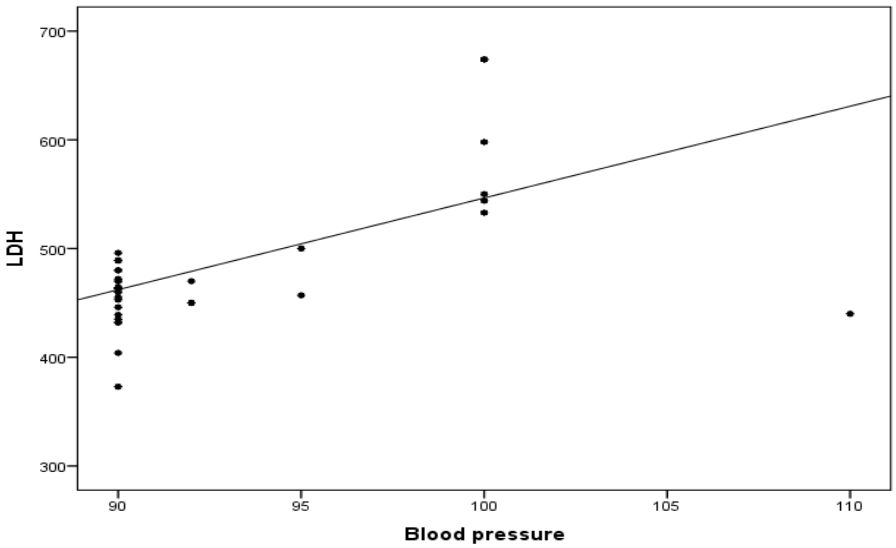

Figure 3: Positive correlation between LDH and diastolic blood pressure in mild PE group.
R .value = 0.629
P .value = 0.002

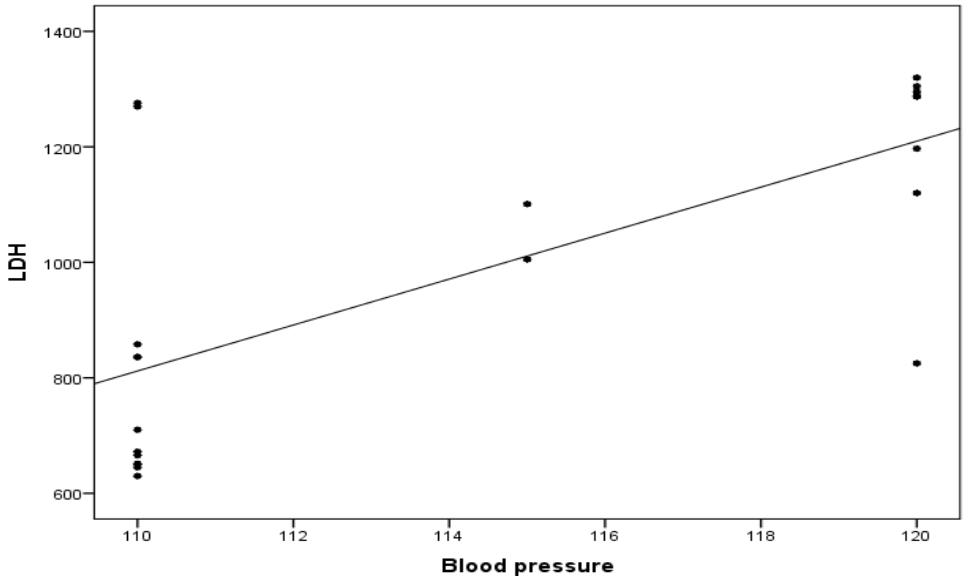

Figure 4: Positive correlation between LDH and diastolic blood pressure in severe PE group.
R.value = 0.699
P.value = 0.000

IV. Discussion

The current study revealed that there is insignificant correlation between Age and LDH, (P.value = 0.845, R.value = 0.026), GGT (P.value = 0.916, R.value = 0.014), and also showed an insignificant correlation between LDH (P.value = 0.520, R. value = 0.085), GGT (P.value = 0.402, R.value = 0.110) and the gestation age/ weeks in PE group. The main findings of this study were; the mean level of LDH is significantly increased in preeclamptic women (665.00±293.007 IU/L) than in normal pregnant women (226.37±22.928 IU/ L, P.value = 0.000), and also, it was found that the mean level of GGT was increased in women with preeclampsia (18.22±6.662IU/L) when compared with the normal pregnant women (11.78±1.776 IU/L, P.value = 0.000). This finding was matched with many previous studies such as the study of Singh P et al [24] which revealed that the mean levels of LDH in hypertensive group was 1011.81±539.31 IU/L, while it was 555.24±237.69 IU/L in normotensive groups p-value = 0.017. In another study conducted by Munde SM et al. study [25]. Who had found GGT and LDH levels are significantly increased among severe and mild cases of PE ($p<0.001$ and ($p<0.05$), respectively than in control group. Our results also found that the mean level of LDH was significantly increased in severe preeclampsia (974.68±272.661 IU/L) than mild preeclampsia (485.71±68.330 IU/L) P.value .000), and also, it was found the mean level of GGT is

significantly increased in severe preeclampsia (25.32±4.444 IU/L), then mild group 14.11±3.494 IU/L, P.value = 000. Likewise, Munde et al. study [25] also suggested a highly significant level was found in women with severe cases of preeclampsia (P<0.001) as compared with mild group. The increased levels of serum LDH and GGT may indicate the cellular damage and dysfunction, which is one of the suggestive causes of preeclampsia, and can, reflects the severity of the disease. Also, our results exhibited positive correlation between LDH and diastolic blood pressure in mild and severe preeclampsia group (P.value = 0.002, R.value = 0.629, P.value = 0.000, R.value = 0.699), respectively, and this go with the study of Singh P et al. [24] which found the rise in LDH was strongly correlated with diastolic blood pressure (correlation coefficient=-0.12). This study showed positive correlation between GGT and diastolic blood pressure in mild preeclampsia group (P.value 0.200, R.value 0.212) but showed significant positive correlation between GGT and diastolic blood pressure in severe preeclampsia group (P.value 0.000, R.value 0.598). The present study is a hospital based study and the results cannot represent the general population, so further study with more sample size is recommended to increase the accuracy of the result

Conclusions: This study concluded that high LDH and GGT levels are associated with the increased severity of Preeclampsia. Therefore, LDH and GGT are useful markers for the monitoring and follow-up of preeclampsia cases to decrease maternal morbidity and mortality.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

Ethics approval: Approval was obtained from the ethics committee of Alzaiem Alazhari University, Khartoum, Sudan. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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