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Original Research Article

A study on Liver function tests and Renal function tests in Preeclampsia

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Abstract

Background: Preeclampsia is a multisystem disorder, which occurs only in pregnant women during the second and third trimesters of pregnancy and is associated with raised blood pressure and proteinuria. Liver Function Test (LFT) abnormalities occur in 3% of the pregnancies and probably the lesion that causes elevated serum liver enzymes. With severe renal involvement, glomerular filtration may be impaired and the plasma creatinine concentration may begin to rise. Elevated uric acid is another component of the preeclampsia.

Materials & Methods: The study was conducted on 70 pregnant women admitted with preeclampsia and eclampsia and 35 normal pregnancy patients in between 19-26 years of age in third trimester of pregnancy from January 2012 to June 2013. Investigations like complete hemogram, liver function tests, renal function tests, coagulation profile, fundus and 24 hours urine for protein were done for all study subjects.

Results: In the present study, in case of mild pre eclampsia, there is elevation of blood urea and serum creatinine but it is not statistically significant, where as in case of severe preeclampsia and eclampsia the elevated values are statistically significant. In the present study, serum uric acid levels are significantly elevated in mild preeclampsia, severe preeclampsia and eclampsia. In the present study, all the Liver function test except serum bilirubin are significantly elevated, but the elevation of serum bilirubin was not statistically significant.

Conclusion: There is a derangement of parameters of RFT and LFT in severe preeclampsia and eclampsia. It may be advised to perform serum uric acid and ALT in preeclampsia & eclampsia to confirm involvement of renal and liver functions.

Keywords: ALT, Blood pressure, Liver function tests, Preeclampsia, Proteinuria, Renal function tests.

1. Introduction

Preeclampsia is a multisystem disorder, which occurs only in pregnant women during the second and third trimesters of pregnancy and is associated with raised blood pressure and proteinuria. It rarely presents before 20 weeks of gestation like in hydatidform mole.[1] Eclampsia is a syndrome with one or more episodes of convulsions in association with preeclampsia. In normal pregnancy there is decreased blood pressure response to pressor substances but in preeclampsia there is marked response to vasopressin, norepinephrine and angiotensin. This response of arterial system leads to generalized vasoconstriction and \hypertension in preeclampsia. Generalized vasoconstriction is responsible for decreased GFR and renal plasma flow. This causes alteration in various biochemical parameters. These alterations secondarily lead to many pathophysiological changes which adversely affect maternal and fetal wellbeing. The incidence of preeclampsia is commonly cited to be about 5% in the western countries. Incidence varies from 8-10% in primigravida and 5% in multigravida.[2] The hospital incidence in India ranges from 1 in 30 to 1in 500. It is more common in primigravida (75%), 5 times more in twin pregnancies and occurs between the 36 week and term in more than 50%cases. Faridmattar and BANA (2000) studied risk factors of maternal morbidity in eclampsia. Major maternal complications include abruption placenta (10%) HELP syndrome (11%) disseminated intravascular coagulopathy (6%), aspiration pneumonitis (7%), pulmonary edema (5%) and death (1%)

Several risk factors have been identified as predisposing to the development of preeclampsia in different populations. They include, 1) Parity- Hansen (1986) reported a two to three fold increase in the incidence in nulliparas and this was supported by Chesley[3] Sibai and his association recently reconfirmed the high risk of developing of pregnancy induced hypertension in primis. Age-Spelacy and associates (1986) evaluated that women of either end of reproductive age group are more susceptible to preeclampsia. Maternal age<20years old was the strongest risk factor for both preeclampsia and eclampsia. [4] Family history- Family aspect of pregnancy was studied by Adams fin Layson (1961). Any differences in preeclampsia incidence seen in the racial groups may in fact be explained by differences in maternal height, weight (both underweight and overweight) age and possible differences in social class. Hamilton (1775) observed that twin gestation predisposes to eclampsia. He concluded that risk increases six times in preeclampsia .Incidence of preeclampsia and eclampsia is great in twin pregnancy with a prevalence of up to 29%.

Pricilla White (1935) described that diabetes mellitus predisposed to eclampsia. Seitz (1916) recognized that preeclampsia is sometimes superimposed upon chronic hypertension. Hydatiform mole: It substantially increases the risk of preeclampsia associated with abnormalities of glomerular histology. Hydropsfetalis, triploidy, fetal malformations and polyhydramnios are some conditions, which predispose to preeclampsia. [5] Others include obesity, socio-economic status, oral contraception usage and cigarette smoking also play a role in the disease. Medical conditions: Chronic renal disease Antiphospholipid antibody syndrome, Connective tissue diseases Thrombophilia.

Liver function abnormalities and renal function abnormalities are the important effects. [6] Preeclampsia is associated with substantial risks for the fetus, which include intrauterine growth retardation, death and prematurity with associated complications. Whereas mother is at risk of seizures (eclampsia), renal failure, pulmonary edema, stroke and death. Even after considerable research, the cause for preeclampsia remains unclear and there are no useful screening tests in early diagnosis of preeclampsia. [7] In HELLP syndrome, an elevation in liver function test results is noted.[8] Periportal hemorrhagic necrosis in the periphery of the liver lobule is Liver Function Test (LFT) abnormalities occur in 3% of the pregnancies, and probably the lesion that causes elevated serum liver enzymes.[9]

With severe renal involvement, glomerular filtration may be impaired and the plasma creatinine concentration may begin to rise. Elevated uric acid is another component of the preeclampsia. Although hyperuricemia does correlate with maternal morbidity, there is an even stronger association of uric acid with the risk for small birth weight infants and with overall fetal mortality. [10] The hyperuricemia of preeclampsia has been variably suggested to be associated with lactic acidosis, altered renal functions or oxidative stress.[11] The aim of the study was to compare liver function tests and renal function tests in preeclampsia and eclampsia with normal pregnancy.

2. Materials and Methodology

In this prospective study, conducted in the Department of Obstetrics & Gynaecology in association with Department of Biochemistry, Sri VenkataSai Medical College, Yenugonda, Mahabubnagar, Telangana. The study was conducted on 70 pregnant women admitted with preeclampsia and eclampsia and 35 normal pregnancy patients in between 19-26 years of age in third trimester of pregnancy from January 2012 to June 2013. Detailed history and examination was carried out. Investigations like complete hemogram, liver function tests, renal function tests, coagulation profile, fundus and 24 hours urine for protein were done. Obstetric management was done as per existing protocol in the department, magnesium sulphate was the drug of choice for controlling convulsions and blood pressure was controlled either by oral nifedipine or methyl dopa. Exclusion criterion includes, pregnant women with other disorders like chronic liver disease, renal disease and medications causing liver damage, pre-existing hypertension, diabetes mellitus, gestational hypertension, active urinary tract infection. A random venous blood sample (5ml) was drawn from the subjects in to a sterile disposable syringe which was transferred into centrifuge tubes and allowed to clot for 30 minutes. The sample was centrifuged at 3000 rpm for 10 minutes and serum was separated and storedat-20c until analyzed. The serum was used for the estimation of urea, creatinine, uric acid, alanine transaminase, aspartate transaminase, bilirubin, LDH.

3. Results

Mean and standard deviation was calculated. T test obtained by SPPS-10.P. Calculated by unpaired chi-square test.

Table-1: Comparison of blood pressure in control and cases of mild preeclampsia

Parameters		Control (n=35)	Mild Pre-eclampsia Group-1 (n=35)	Severe Pre-eclampsia Group-2 (n=35)
Diastolic Blood Pressure	Mean	75	94.7	104.5
	SD	6.30	11.5	6.1
	T-test		11.5	20.7
	P-value		0.0001*	0.0001*
Blood Urea	Mean	16.54	17.31	23.25
	SD	1.65	1.72	3.18
	T-Test		6.2	8.9
	P-Value		0.54	0.001*
Serum Creatinine	Mean	0.62	0.64	1.09
	SD	0.06	0.065	0.23
	T-Test		0.51	11.5
	P-Value		0.82	0.0001*
Serum Uric acid	Mean	3.63	4.6	7.04
	SD	0.19	0.4	1.57
	T-Test		2.5	12.7
	P-Value		0.0001*	0.0001*

* Statistically Significant.

RFT in Controls, Group-1 and Group-2: Comparison of renal parameters in control and cases with mild preeclampsia and severe preeclampsia

Table-3: Comparison of liver parameters between normal, mild preeclampsia and severe preeclampsia

Parameter		Control (n=35)	Milder eclampsia Group-1 (n=35)	Severe Preeclampsia Group-2 (n=35)
AST	Mean	33.17	42.5	60.51
	SD	2.06	5.6	9.6
	T-test		9.29	6.1
	P-value		0.0001*	0.001*
ALT	Mean	27.31	36.6	51.94
	SD	2.9	3.5	11.18
	T-test		12.03	2.5
	P-value		0.0001*	0.0001*
LDH	Mean	260.2	289	440.02
	SD	17.44	28.17	108.45
	T-test		5.3	17.5
	P-value		0.0001*	0.0001*
Total Bilurubin	Mean	0.79	0.80	0.94
	SD	0.15	0.151	0.32
	T-test		0.41	2.5
	P-value		0.6799	0.075

* Statistically Significant

4. Discussion

Hypertensive disorders complicating pregnancies are common and form one of the deadly triad along with hemorrhage and infection that contribute greatly to maternal morbidity and mortality. In this study 80% are primis in preeclampsia and eclampsia cases Diastolic BP is significantly elevated in preeclampsia and eclampsia patients. In the present study non protein nitrogenous substance like urea, creatinine and uric acid and liver function tests like AST, ALT, LDH and total bilirubin are studied in preeclampsia and eclampsia and normal pregnancy the results of present studies are discussed under 3 groups. (1) Control group (normal pregnancy) (2) Mild preeclampsia (Group-1) (3) Severe preeclampsia and eclampsia (Group-2)

A total number of 35 normal pregnant women were studied. The age group of these subjects ranged from 19-26yrs. All these subjects are normotensive and healthy pregnant women. The results of liver function tests are within normal limits in this group. This is in line with the study by Ylostolo (1970), Panerietal (2011) and renal function tests are in the lower limit of non-pregnancy reference range. Group-1 (Mild preeclampsia): A total number of 35 cases have been studied in this group. Liver function tests are significantly elevated compared to control group. Renal function tests like urea and creatinine are not significantly elevated. But serum uric acid is increased significantly ($p<0.0001$).

Group 2 (Severe preeclampsia and eclampsia): In these cases there is significant raise in liver parameters which are constantly elevated except serum bilirubin level which is not significantly higher when compared to that of controls ($p<0.654$) of same age. This correlates to study by Paneri *et al* [12] LDH levels are significantly elevated ($P<0.001$). LDH 5 is specific to liver pathology. Jaleel *et al* [13] found that there was a highly significant rise in serum lactate dehydrogenase and aspartate aminotranferase level in preeclamptic women compared to normotensive pregnant women. Serum ALT of severe preeclamptic and eclamptic women in this study was significantly ($p<0.001$) elevated from their normotensive pregnant counterparts. Malvino *et al* observed that in preeclampsia the serum transaminase level was raised to >70 U/L and can rise up to 210U/L in eclampsia. [14] In the present study, the mean serum AST level in preeclamptic cases was found significantly higher ($p<0.001$) than the normotensive control group. Rath *et al* also noticed elevated level of ALT and AST in severe preeclampsia. [15] The mechanisms driving the abnormal elevation of liver enzymes AST, ALT leading to preeclampsia are unclear. In preeclampsia hyper vascularization and vasoconstriction of liver leads to liver cell injury and alteration of cell membrane permeability and damage to the cells which allows intracellular enzyme to leak in to the blood, leading to elevated liver enzymes (Kokia E1990, Madazilla 1990) like SGOT, SGPT. Serum creatinine and urea is significantly elevated $P<0.001$ in these cases. It is line with Jumaan *et al*·[16] Some investigators found that the activity of mono amino oxidase (MAO) is lower and serotonin is higher in the placental tissue from women with preeclampsia as compared with placental tissue from normal pregnant women. [17-18] these factors lead to a reduction in renal perfusion in a woman with PIH, by an average of 20% and reduction in GFR by an average of 32% in comparison with normal pregnant women near term. [19] So, as a result of reduced GFR, serum creatinine levels and blood urea rise above normal pregnancy levels [20]. Hussein *et al* and Salako, *et al* who found that no significant difference in the mean value of creatinine in preeclamptic and normotensive pregnant women. [21-22]

In the present study, there is a significantly raised uric acid level. In several studies it was found that the extent of the elevation in serum uric acid level in preeclamptics was an indicator for the degree of severity of this disorder. Elevated serum uric acid levels have also been interpreted to act as an important cofactor involved in the pathogenesis and manifestation of pre-eclamptic disorder. It is in line with study of Jumaan *et al* [16]. Suchandaand Kiyomi *et al* [23-24] also had same results. Present study suggest that serum liver enzymes AST, ALT, LDH and Uric acid appears to be of immense value in understanding the pathogenesis and also appears to be an important contributing factor of preeclampsia.

5. Conclusion

Liver and renal involvement is common in preeclampsia and eclampsia. There is a derangement of parameters of RFT and LFT in severe preeclampsia and eclampsia. But there was no significant elevation in mild preeclampsia. The average diastolic BP when significance changes occurred was around 105mmHg. Persistent renal parameter that increased was serum uric acid. Persistent liver parameter that increased was ALT (more specific to the liver damage). These can be taken as predictors of the disease. It may be advised to perform uric acid and ALT in preeclampsia and eclampsia to rule out involvement of renal and liver functions.

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