Original research article

Biochemical Profile of Pre-eclampsia – A Case Control Study at Rural Set-up

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Abstract

Background: Preeclampsia is considered a systemic syndrome of pregnancy and may show hepatic and renal involvement. Serum electrolytes play important role in development of hypertention.

Objective: To study serum electrolytes and biochemical parameters under liver function tests and renal function tests of pre-eclampsia patients in comparison to normal pregnant women.

Method: A case control study was conducted during one year, on 50 cases of pre-eclampsia and 50 controls who were normotensive pregnant females. Their demographic and clinical details were obtained and laboratory analysis of serum electrolytes, liver function tests and renal function tests was done.

Observations: Serum sodium, potassium, calcium, chloride, bicarbonate, Albumin, total protein levels and Aspartate aminotransferase levels were significantly lower in pre-eclampsia cases than in normotensive controls. Alanine Transaminase, Alkaline phosphatase and Uric acid levels were significantly higher in cases of pre-eclampsia as compared to controls.

Conclusion: Close monitoring of pre- eclampsia patients is must as it has deleterious effect on liver and kidney along with electrolytes which may increase maternal and fetal morbidity and mortality.

Keywords: pre-eclampsia, LFT, KFT, electrolytes.

Introduction

Pregnancy Induced Hypertention [PIH] is a most common disorder among pregnant women and an important cause of maternal and fetal morbidity and mortality[1].Preeclampsia is considered a systemic syndrome of pregnancy, which is manifested as new onset highblood

pressure (systolic ≥140mmHg or diastolic ≥90mmHg) and proteinuria of ≥ 0.3 grams per 24 hours occuring after 20 weeks of gestation in a woman that was previously normotensive.[2]Incidence of preeclampsia in India is reported to be 8-10% of all pregnancies[3,4].The etiology of pre-eclampsia is still inconclusive but defective trophoblastic invasion due to disturbed interactions between fetal trophoblasts and maternal cells is considered to be the major patho-physiology[3,5]. Serum electrolytes play a significant role in regulation of blood pressure as they have significant effect on functioning of vascular smooth muscles[6].

International Society for the Study of Hypertension in Pregnancy [ISSHP], in 2014 recommended that the criteria for diagnosis of preeclampsiashould be - blood pressures of 140/90 mmHg or higheron two occasions combined with either urinary proteinexcretion of ≥300mg/day or new onset ofmaternal organ dysfunction(creatinine ≥ 90μmol/l), liver involvement (elevatedtransaminases), haematological complication (thrombocytopeniaplatelet <150,000/cmm), neurological complications,and fetal growth restriction[7].Thus, liverfunction tests, renal function tests, though not specific for pre-eclampsia but maybehelpful incharacterizing thedegree of end-organ Damage. Thus, this study aims at studying the serum electrolytes andbiochemical parameters under liver function tests and renal function tests of pre-eclampsia patients in comparison to normal pregnant women.

Material and methods

This was a case control study conducted during a period of one year from march 2018 to march 2019 in department of Obstretics and Gynaecology, of JIIU's Indian Institute of Medical Science and Research, Jalna , Maharashtra .

This study was conducted on 100 study participants consisting of 50 cases of pre-eclampsia and 50 controls who were pregnant females without raised blood pressure. The cases were defined as pregnant females ≥20weeks of gestation with blood pressure ≥ 140/90mm of Hg noted first time during pregnancy on ≥ 2 occasions at least 6 hours apart with proteinuria of ≥ 1+by dip stick [Uristix] method in a random urine sample. Pregnant females with history of chronic hypertension before pregnancy, diabetes mellitus, chronic liver or renal disease, congestive heart failure, thyroid/ parathyroid disorders and with history of intake of anti-hypertensive drugs were excluded from study. Approval of Institutional Ethical Committee and informed consent was taken from all the study participants. Demographic and clinical data regarding age, history of drug intake, chronic diseases etc was collected from study subjects by interviews. General, systemic and obstetric examination was conducted of all the study participants. Serum electrolytes consisting of sodium, potassium, calcium, chloride, bicarbonate ions and anion gap were analysed using Easylyte Plus Electrolyte analyser. Total bilirubin, albumin, total protiens, Alanine Transaminase [ALT] levels , Alkaline phosphatase [ALP] and Aspartate aminotransferase [AST] levels along with serum creatinine, urea and uric acid levels were analysed by fully automatic biochemistry analyser [Erba Em 200]. All the measurements were conducted in duplicate. All the data was collected in Microsoft Excel Sheet and was subjected to appropriate descriptive and inferential statistical tests. GraphpadInStat (version3.06) was used for statistical analysis.

Results and observations

In the present study 100 study subjects were included out of which 50 were cases and 50 were controls. Most of the study subjects belonged to gravida 2 para1[G2P1][25/100], followed by G3P2 [15/100]. Table 1 shows Mean age, gestational age, weight, systolic and diastolic blood pressure of the study subjects . There were no differences in terms of maternal age between

case and control groups but gestational age was statistically more in cases. Significantdifferences were noted with regard to systolic and diastolic bloodpressure between study participants.

Table 1: comparison of clinical profile among cases and controls					
Study subjects	cases		controls		P Value
	Mean	SD	Mean	SD	
Age [years]	23.52	2.852	23.66	2.692	0.8
Gestational age [weeks]	37.22	1.2	36.48	1.7	0.008
Weight [Kg]	54.42	10.8	46.74	9.6	0.001
Systolic BP [mm of Hg]	148.84	7.5	124.06	8.6	0.000
Diastolic BP [mm of Hg]	80.36	8.5	76.96	8.13	0.1

P value –Cases vs Controls, Independent Sample Mann Whitney U test

The difference between the weight of cases and controls was statistically more significant with cases of pre-eclampsia having more weight than controls.
Edema was found in 49 out of 50 cases of preeclampsia as compared to 43 out of 50 controls, which is statistically significant [P=0.027].[Pearson chi-Square test]

Table 2: comparison of serum Electrolytes among cases and controls					
Study subjects	Cases		Controls		P value
	Mean	SD	Mean	SD	
Serum sodium [mEq/L]	132.22	2.902	137.06	2.453	0.000
Serum potassium [mEq/L]	3.69	0.662	5.07	5.379	0.000
Serum calcium [mEq/L]	8.35	1.072	9.17	1.333	0.000
Serum chloride [mEq/L]	94.12	9.465	97.14	8.013	0.006
Serum bicarbonate [mEq/L]	19.7	6.085	24.8	3.897	0.000
Anion gap	18.4	12.693	15.12	10.737	0.037

P value –Cases vs Controls, Independent Sample Mann Whitney U test

The above table shows that serum sodium, potassium, calcium, chloride and serum bicarbonate levels were significantly lower in pre-eclampsia cases than in controls. However, Anion gap is statistically higher in pre-eclampsia cases than controls.

Table 3: Comparison of Liver Function Tests among Cases and Controls					
Study subjects	Cases		Controls		P Value
	Mean	SD	Mean	SD	
Total Bilirubin [mg/dL]	1.11	1.479	0.86	0.379	0.097
Albumin [g/dL]	3.95	0.445	4.68	4.103	0.02
Total Protien [g/dL]	6.74	0.669	8.75	10.2	0.004
ALT [IU/L]	33.14	12.665	32.76	27.003	0.1
AST [IU/L]	25.36	6.639	30.48	14.541	0.006
ALP [IU/L]	181.32	122.773	178.02	91.918	0.558

P value –Cases vs Controls, Independent Sample Mann Whitney U test

The above table shows albumin and total protein levels were significantly lower in cases as compared to controls. In case of liver enzymes, Alanine Transaminase [ALT] levels and Alkaline phosphatase [ALP] levels were significantly higher in cases of pre-eclampsia as compared to controls, whereas, Aspartate aminotransferase [AST] levels were significantly lower .

Table 4: Comparison of Renal Function tests among Cases and Controls					
Study subjects	Cases		Controls		P value
	Mean	SD	Mean	SD	
Se. Urea [mg/dL]	37.08	12.182	49.66	8.191	0.000
Se.Creatinine [mg/dL]	1.44	0.274	1.65	0.309	0.000
Se. Uric Acid [mg/dL]	5.79	0.838	5.47	0.941	0.045

P value –Cases vs Controls, Independent Sample Mann Whitney U test

The above table shows that serum Urea and serum Creatinine levels were significantly lower among cases of pre-eclampsia as compared to controls , but serum Uric acid levels were significantly higher in cases.

Discussion

Pre-eclampsia is a multi-system disorder of wide spread endothelial dysfunction and vasospasm occurring after 20 weeks of gestation leading to hypertension and proteinuria with or without pathological edema[1]. Recent epidemiological studies show that maternal mortality rate due to pre-eclampsia is highest in low and middle income countries. It is also associated with increased perinatal mortality and increased premature births and congenital neurological disabilities[4,8].

There was no statistical difference (p>0.05)between the mean age of cases and control. Gestational age of the cases was statistically (p<0.05) more as compared to controls. Cases had statistically more weight and more occurance of edema than controls.
Both systolic blood pressure and diastolic blood pressure were statistically higher in cases as compared to normotensive controls. Mean arterial blood pressure drops significantly during normal pregnancy as compared to normotensive non-pregnant state and rises significantly in pre-eclampsia. There is approximately 30% reduction in vascular pressure which is caused by

peripheral vasodilatation mediated by nitric oxide synthesis and is upregulated by oestradiol and production of prostacyclin[9].

The serum sodium levels were significantly lower among pre-eclamptic cases as compared to normotensive controls. This suggests that hyponatremia may be associated with preeclampsia which correlates with a study done by Indumati et al [10] which demonstrated a linear decrease of sodium in preeclampsia as compared to normotensives. Available data suggests that hyponatremia in pre eclampsia may be associated with increased risk of severe symptoms like seizures[11,12].It is suggested that syndrome of inappropriate antidiuretic hormone secreation [SIADH] and low effective plasma volume may lead to non-osmotic ADH release , leading to hyponatremia in pre-eclampsia. Also , abnormalities of cell membrane transport of sodium with extravascular sodium retention may play role[13]. Serum potassium levels were significantly lower among cases as compared to controls. This finding correlates with finding of other previous studies studies [12,13,14] Serum calcium levels were significantly lower in cases as compared to controls. Dietary deficiency of calcium during pregnancy has been implicated in pre-eclampsia[15]. Serum chloride and bicarbonate levels were significantly lower in pre-eclamptic cases than normotensive controls , whereas, the Anion gap was significantly higher among cases. Among liver function tests , the mean total plasma protein and albumin levels were significantly lower in cases as compared to controls which is due to urinary loss of protein in study group as observed by urine spot test. Further more , levels of transaminases [AST and ALT] were significantly elevated in cases as compared to controls in this study which correlates with the previous similar studies[2]. Increased transaminases may be due to hypoxic effect of pre-eclampsia on liver, resulting in degeneration and necrosis of hepatocytes. Among renal function tests, mean serum creatinine and urea levels were found to be significantly lower among cases than controls. However, mean serum uric aciid levels were statistically increased in cases than controls which correlates with the previous similar studies[16]. During early normal pregnancy serum uric acid levels fall and later rise to no pregnant levels. In pre-eclampsia uric acid levels rise much earlier than onset of hypertension and proteinuria. This hyperuricemia may elicits proinflammatory effect with endothelial cell dysfunction, vascular damage and hence, worst outcome[16].

Conclusion

Thus this study shows that pr-eclampsia has harmful effects on liver and kidneys as shown by deranged results of liver function tests and renal function tests in cases as compared to controls.pre-eclampsia also significantly alters the electrolyte balance. Hence, close monitoring of pre- eclampsia patienst is must to prevent maternal and fetal morbidity and mortality.

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