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Importance of Serum High Sensitivity C-Reactive Protein and Serum Uric Acid as a Diagnostic Markers In Preeclampsia- A Cross Sectional Study

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Abstract

Background: Preeclampsia is a disorder of widespread vascular endothelial malfunction and vasospasm, which occurs after gestational age of 20 weeks and can present as late as 4-6 weeks postpartum. It is clinically defined by hypertension and proteinuria, with or without pathological edema. Preeclampsia is associated with increased risks of cerebrovascular complications, disseminated intravascular coagulation (DIC), placental abruption and maternal death.

Objective: To Compare changes in levels of S.Hs-CRP and S.Uric Acid in patients of preeclampsia & normal pregnant women.

Material And Method: Serum Hs-CRP and Serum Uric acid were estimated in 50 cases of preeclampsia and 50 controls of normal pregnant women. 5 ml of blood collected with clot activator vaccutte and assayed on an Erba XL 640 Fully Automated Analyzer.

Result: The levels of S.Hs-CRP & S.Uric acid were increased significantly in patients of Preeclampsia ($p<0.001$) as compared to normal pregnant women.

Results also prove that these biomarkers can be used as diagnostic markers of preeclampsia.

Conclusion: The levels of S.Hs-CRP increased in patients of Preeclampsia. As hs- CRP plays important role in eliciting the inflammatory processes. It acts as a scavenger and responsible for clearance of membranes and nuclear antigens. The levels of S.Uric acid also increased significantly in patients of Preeclampsia. The Abnormal trophoblast invasion is reported in preeclampsia, causes less blood supply and so placenta becomes hypoxic. This causes placental tissue breakdown and provides source of purines for generation of uric acid by xanthine oxidase.

Keywords: Preeclampsia, Serum Hs-CRP (High Sensitivity C - reactive protein), Serum Uric Acid

Introduction

Preeclampsia is one of the most common medical complications during pregnancy. The patho-physiology of preeclampsia remains uncertain despite many research efforts. Several etiologies have been implicated in the development of preeclampsia, those includes abnormal trophoblast invasion of uterine blood vessels, immunological intolerance between fetoplacental and maternal tissues, mal-adaptation to the cardiovascular changes or dietary deficiencies and genetic abnormalities1.

Preeclampsia is defined as a blood pressure of at least 140/90 mmHg measured on two occasions each 6 hr apart, accompanied by proteinuria of at least 300 mg

per 24 hr, or at least 1+ on dipstick testing. In developing nations, the incidence of the disease has been reported as 4-18% 2 with hypertensive disorders being the second most common obstetric cause of stillbirths and early neonatal deaths.

There is an increasing evidences that preeclampsia is a systemic inflammatory disease. Activation of haemostatic system and endothelial activation are the key components of systemic inflammatory response. The hs-CRP is a sensitive marker of tissue damage and inflammation. Its production is stimulated by inflammatory cytokines, Interleukin-6 and α- Tumor Necrosis Factor3. The hs-CRP plays important role in eliciting the inflammatory processes4. It acts as a scavenger and responsible for clearance of membranes and nuclear antigens5. Hs-CRP is useful in differentiating acute inflammation as well as assessment of severity of inflammation.

Hyperuricemia is a common finding in preeclamptic pregnancies. The elevation of uric acid in preeclamptic women often precedes hypertension and proteinuria6, the clinical manifestations used to diagnose the disorder. There are several potential origins for uric acid in preeclampsia; abnormal renal function, increased tissue breakdown, acidosis and increased activity of the enzyme xanthine oxidase/dehydrogenase 7.

Material And Method

In the present cross-sectional study, 50 cases of preeclampsia and 50 controls of normal pregnant women were selected from civil hospital and B.J. Medical College, Ahmedabad, Gujarat. Study is conducted during the period of January 2015 to June 2015. All patients were primarily evaluated by clinical examination.

For Serum Hs-CRP and Serum Uric Acid estimation 5 ml of blood collected with clot activator vaccutte and sample are transported to the laboratory at 2-8°C within half an hour. Serum is removed from the clot within 2 hours of draw.

All samples are immediately subjected to assays after thawing at 37°C. The measurement of Serum Hs-CRP and Serum Uric Acid levels are assayed on an Erba XL 640 Fully Automated Analyzer.

Result

The present study was done at Civil Hospital, Ahmedabad. Patients of Preeclampsia (50 cases) and normal pregnant women (50 controls) were included in study. Blood samples were collected at time of admission and were tested for Serum Hs-CRP and Serum Uric Acid on Erba XL 640 fully auto analyzer. Data analysis was done by using t- test.

Table –1: Comparison of Control Group & Study Group

Parameter s	Biological Reference Interval	Control group (n=50)			Study group (n=50)			Significanc e
		Mi n	Ma x	Mean ± SD	Min	Ma x	Mean ± SD	
Hs-CRP	<1.0 mg/l	0.4	4.4	1.348±0.73	1.3	11.4	3.702±1.58	t =9.525, **p < 0.001
Uric Acid	3.2-7 mg/dL	3.7	8.7	5.248±1.13	3.6	10.8	7.046±1.51	t = 6.721, **p < 0.001

Note: * p< 0.05 = Significant, **p < 0.01= Highly significant, p>0.05 = Not significant

Table-2: Comparison of S. Hs-CRP levels between control & Study group

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Group	S. Hs-CRP (Control)	S. Hs-CRP (Study Group)
Mean	1.348	3.702
Standard Deviation (SD)	0.73	1.58
Sample Size	50	50
Std. error of Mean (SEM)	0.19	0.22
Minimum	0.4	1.3
Maximum	4.4	11.4
Significance	t =9.525, p < 0.001	

Serum Hs-CRP level shows significant increase in study group as compare to normal healthy control group (p < 0.001).

Figure 1: Comparison of mean ±SD of serum Hs-CRP in Study & control group

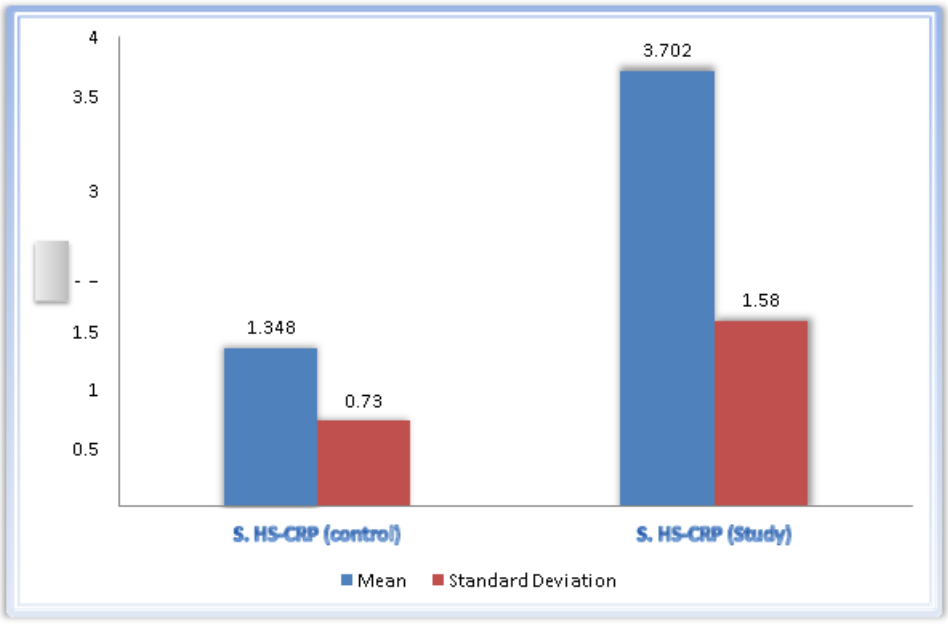

Table-3: Comparison of S. Uric Acid levels between control & Study group

Group	S. Uric Acid (control)	S. Uric Acid (Study Group)
Mean	5.25	7.05
Standard Deviation (SD)	1.13	1.51
Sample Size	50	50
Std. error of Mean (SEM)	0.15	0.21
Minimum	3.7	3.6
Maximum	8.7	10.8

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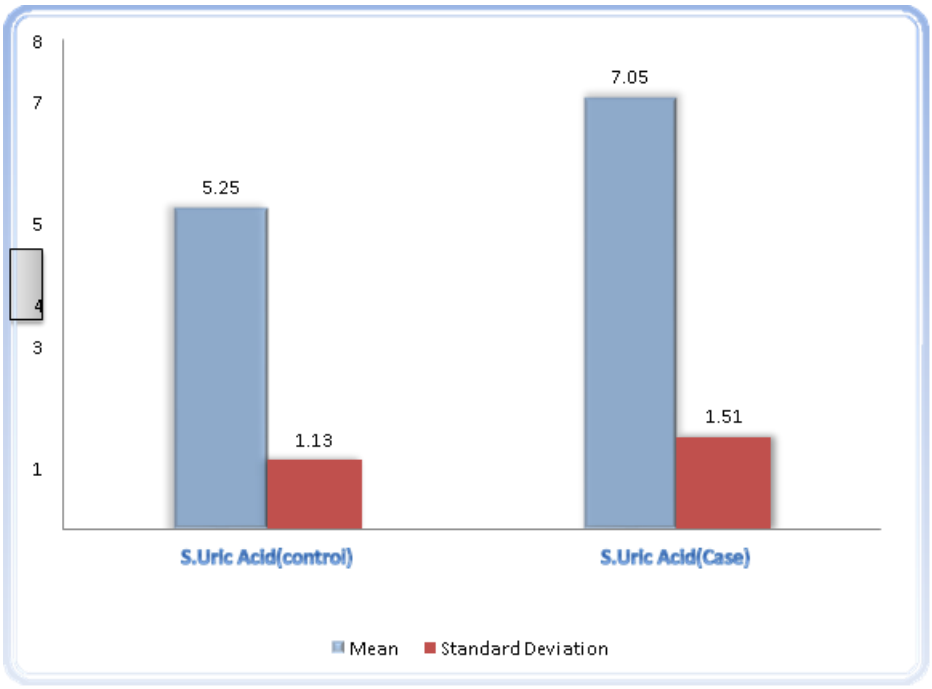
Significance	t=6.721, p < 0.001

Serum Uric acid level shows significant increase in study group as compare to normal healthy control group (p < 0.001).

Figure 2: Comparison of mean ±SD of serum Uric Acid in Study & control group



Discussion

The present study was undertaken to know the status of serum HS-CRP and serum uric acid levels in preeclamptic women. From the beginning of scientific research the etiology of preeclampsia has been the subject of more investigations and speculations. Although, one should note that a unifying etiology of preeclampsia has not been identified, investigations performed during the last two decades have substantially advanced. Improvement in health and increase in the rate of survival of mother and fetus is essential for global health equity.

Present study shows that level of serum Hs-CRP increases in preeclamptic patients (3.702±1.58) as compared to normal pregnant women (1.348±0.73). Results of the present study correlated well with the previous studies done by Anil B et al 20118 and Vijayalakshmi P et al 20159

The primary cause to develop a disease may be due to insufficient invasion by trophoblast cells in uterine wall in early pregnancy. Possible hypothesis for its pathogenesis is reduced placental perfusion as a result of shallow invasion this leads to increased lipid peroxidation and the release of oxygen radicals without counter regulation by antioxidants.

In addition to this activation of neutrophils and macrophages, this promotes cytokine production and further leads to maternal endothelial dysfunction10. Although inflammation may not be the exact cause of pre-eclampsia, it may enhance the pathology of the disorder in the presence of the anti-angiogenic factors 11. Hwang HS et al showed that hsCRP levels were positively correlated to pregnancy duration in healthy women and could be used as a severity marker in women with severe PE12.

In present study serum uric acid level found increase in preeclamptic patients (7.046±1.51) as compared to normal pregnant women (5.248±1.13). Results of the present study correlated well with the previous studies done by Manjareeka M et al 201313 and Anil

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B et al 20118 and demonstrate that increase serum concentration of uric acid in preeclampsia.

Uric acid is marker of oxidative stress, tissue injury and renal dysfunction. Abnormal trophoblast invasion is reported in preeclampsia, because of which placenta receives less blood supply from uteroplacental artery. Subsequently placenta becomes hypoxic. This hypoxia causes placental tissue breakdown and provides additional source of purines. Placenta and damaged placental tissues are the rich sources of purines for generation of uric acid by xanthine oxidase14

Conclusion

The present study was aimed to measure the levels of Hs-CRP and uric acid in patients of Preeclampsia and to evaluate whether these parameters can be used as diagnostic markers of Preeclampsia.

The following conclusions can be drawn from this study:

1. The levels of S.Hs-CRP & S.Uric acid were increased significantly in patients of Preeclampsia.($p<0.001$)
2. Results also prove that these biomarkers can be used as diagnostic markers of preeclampsia.

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