

## Research Article

# A comparative study on renal function parameters and age in females with and without pre-eclampsia in a tertiary health care setup

Geraldine Monteiro, Subbalakshmi NK\*, Anupama N, Rekha D Kini and Sheila R Pai

*\*Department of Physiology, Kasturba Medical College Mangalore, Manipal University, Mangalore 575001, Karnataka State, India*

### \* Correspondence Info:

Dr. Subbalakshmi NK,  
Department of Physiology,  
Kasturba Medical College, PO Box 53,  
Manipal University, Light House Hill Road, Hampanakatta, Mangalore 575001, Karnataka  
Email: [rao.subbalakshmink@rediffmail.com](mailto:rao.subbalakshmink@rediffmail.com)

### Abstract

**Background and objective:** Pathogenesis of preeclampsia is known to be associated with renal dysfunction. But the best suited renal function parameter to quantify pathogenesis of this clinical condition is unclear. This study is aimed to assess the renal parameters in preeclampsia.

**Materials and Methods:** 185 consecutive mothers in 20th week of gestational period were enrolled into the study. Based on the presence or absence of preeclampsia they were divided into two subgroups: Group A (82 mothers with preeclampsia) and Group B (103 normotensive mothers).

**Results:** In all the mothers serum urea, serum creatinine and serum uric acid was measured. Serum uric acid of group A was very significantly higher compared to group B ( $p < 0.0001$ ). Serum urea and serum creatinine of group A was just significantly higher compared to group B ( $p < 0.05$ ).

**Conclusions:** Among the renal function parameters measured uric acid was better suited in assessing renal dysfunction in mothers with preeclampsia.

**Keywords:** serum creatinine, serum urea, serum uric acid, preeclampsia, renal dysfunction

## 1. Introduction

The hypertensive disorders during pregnancy affect up to 8.0% of all pregnancies<sup>1</sup> and remain a major cause of maternal and neonatal mortality and morbidity worldwide. 2 Pre-eclampsia, a multi-system disorder, associated with raised blood- pressure and proteinuria with or without accompanying symptoms, abnormal maternal laboratory test results, intrauterine growth retardation, or reduced amniotic fluid volume. In women with pre-eclampsia, a history of symptoms is obtained antenatally, with the key alarming clinical symptoms being headache, vomiting, visual disturbances and epigastric pain. However the unpredictable onset and progression of these symptoms warrants the need for an early and appropriate detection. 3 The objective of this was to study the renal manifestations by measuring serum urea, serum creatinine, serum uric acid levels and albuminuria in subjects with and without preeclampsia.

## 2. Materials and Methods

This study was done in teaching hospitals attached to Kasturba Medical College after obtaining permission from ethical committee of the institution overseeing human studies and consent from the study participants.

185 consecutive mothers in 20th week of gestational period were enrolled into the study, in whom fresh medical report on serum protein, serum urea, serum creatinine and random blood sugar was available. They were divided into two

groups namely, group A (n = 82) diagnosed with preeclampsia and group B (n = 103) comprising of normotensive mothers.

In this study the diagnosis of preeclampsia was based on the definition of American College of Obstetrics and Gynecologists.<sup>4</sup>

In all the subjects, height and weight was measured and body mass index was calculated using the formula weight in kilogram divided by height in meters squared. Systolic and diastolic blood pressure was measured in sitting position.

Data was analyzed employing unpaired student t test. When data was not uniformly distributed non-parametric methods namely Mann-Whitney test was used. p value less than 0.05 was taken as statistically significant.

### 3. Result

Data is presented as mean  $\pm$  SD. Comparison of data on baseline characteristics of mothers with preeclampsia and normotensive mothers are presented in Table 1. Data on renal function parameters in these two groups are presented in Table 2.

The mean systolic and diastolic blood pressure of mothers with preeclampsia was significantly higher compared to normotensive mothers ( $p < 0.0001$ , Table 1). Mean age of the mothers with preeclampsia was significantly higher compared to normotensive mothers ( $p = 0.0004$ ). Mean random sugar and body mass index of mothers with preeclampsia did not differ significantly compared to normotensive mothers (Table 1).

All the measured renal function parameters were significantly higher in mothers with preeclampsia (Table 2). Mean protein and uric acid was significantly higher in preeclampsia group compared to normotensive mothers ( $p < 0.0001$ , table 2). In mothers with preeclampsia serum urea ranged from 4-55 mg/dl. In normotensive mothers serum urea ranged from 4-45 mg/dl. In mothers with preeclampsia creatinine level ranged from 0.3 mg/dl to 1mg/dl. In normotensive mothers serum creatinine level ranged from 0.3-1.4. Mean urea and creatinine was significantly higher in mothers with preeclampsia compared to normotensive mothers ( $p < 0.05$ , Table 2).

**Table 1. Baseline characteristics of preeclamptic and normotensive mothers (values are mean  $\pm$  SD)**

Variables	With preeclampsia (n= 82)	Without preeclampsia (n =103)	t /u value	P value
Age (years)	29.74 $\pm$ 3.81	27.60 $\pm$ 4.20	2.142	0.0004
Body Mass index (kg/m <sup>2</sup> )	26.08 $\pm$ 2.84	25.47 $\pm$ 2.66	1.504	0.13
Systolic blood pressure (mmHg)	157.80 $\pm$ 10.77	117.76 $\pm$ 6.99	125.50	0.0001
Diastolic blood pressure (mmHg)	98.90 $\pm$ 6.85	73.00 $\pm$ 4.60	0.000	< 0.0001
Random blood sugar (Mg/dl)	116.47 $\pm$ 29.63	115.59 $\pm$ 25.88	3997.0	0.533

**Table 2 Renal function parameters in mothers with and without preeclampsia (values are mean  $\pm$  SD)**

Variables	With preeclampsia (n= 82)	Without preeclampsia (n =103)	t /u value	P value
Total urine protein	6.84 $\pm$ 1.53	5.39 $\pm$ 1.06	1941.5	< 0.0001
Serum urea (mg %)	22.18 $\pm$ 15.38	16.13 $\pm$ 10.23	3512.0	0.0496
Serum Creatinine (mg %)	0.65 $\pm$ 0.19	0.61 $\pm$ 0.17	3487.5	0.0418
Serum Uric acid (mg/dl)	6.05 $\pm$ 1.72	4.52 $\pm$ 1.54	2073.5	< 0.0001

### 4. Discussion

In this study we compared the baseline characteristics and renal parameters between mothers with preeclampsia and normotensive mothers.

Among the baseline characteristics studied, mean age of preeclampsia group was significantly higher compared to normotensive mothers (Table 1). This finding suggests that women are at greater risk of preeclampsia with advancing age.

Pregnancy induced hypertension is associated with greater risk of intrauterine growth retardation and intrauterine death of foetus. Preeclampsia is a pregnancy-specific disease manifested by hypertension, coagulopathy, and impaired tissue perfusion. Its etiology remains unclear, and it is possible that the rise in blood pressure is a manifestation of more than one pathophysiological condition.<sup>5-8</sup> One of these conditions is related to abnormal renal function.<sup>9,10</sup> Accordingly in the

present study, mean serum urea, serum creatinine and serum uric acid was significantly higher in women with preeclampsia compared to normotensive pregnant women (Table 2).

In the present study, serum uric acid level was much higher in mothers with preeclampsia unlike the other renal function parameters namely serum urea and serum creatinine compared to normotensive mothers (Table 2). This finding suggests that measurement of uric acid may be suitable marker in identifying pregnant women at greater risk for preeclampsia. Findings of previous research work on association between uricemia and pregnancy induced hypertension is conflicting. Wake et al<sup>11</sup> have observed that in subjects with pre-eclampsia plasma uric acid level will help to predict those that will develop eclampsia. Hawkins et al<sup>12</sup> have reported that hyperuricemia in hypertensive pregnancy remains an important finding because it identifies women at increased risk of adverse foetal outcome even women with gestational hypertension without any other features of pre-eclampsia. In the study of Mustaphi et al<sup>13</sup> high positive correlation was observed between levels of serum uric acid and severity of pregnancy induced hypertension in relation to hypertension and proteinuria. However, Hickman et al<sup>14</sup> have noted serum uric acid as an unreliable indicator of developing hypertension in the individual women. Salako et al<sup>15</sup> have reported that single estimation of serum uric acid level early in pregnancy are of little value in the prediction of pre-eclampsia. However our study finding suggests serum uric acid level is associated with preeclampsia.

## 5. Conclusion

Abnormal renal function is related to pathophysiology of preeclampsia. Aging increases the possibility of preeclampsia during pregnancy.

## References

1. Sullivan CA, Martin JN. Management of the obstetric patient with thrombocytopenia. *Clin Obstet Gynecol* 1995; 38: 521-34.
2. Ferrazzani S, Luciano R, Garofalo S, D'Andrea V, De Carolis S, De Carolis MP, et al. Neonatal outcome in hypertensive disorders of pregnancy. *Early Hum Dev*. 2011; 87(6): 445-49.
3. Michelle Hladunewich, S Ananth Karumanchi, Richard Lafayette. Pathophysiology of the Clinical Manifestations of Preeclampsia. *Clin J Am Soc Nephrol* 2007; 2: 543-549.
4. American College of Obstetrics and Gynaecologists. Management of preeclampsia. Technical Bulletin No.1. Washington, DC; *American College of Obstetrics and Gynaecology*, 1986
5. Wang Y, Walsh SW, Kay HH. Placental lipid peroxides and thromboxane are increased and prostacyclin is decreased in women with preeclampsia. *Am J Obstet Gynecol* 1992; 167:946-949.
6. Seligman SP. The role of nitric oxide in the pathogenesis of preeclampsia. *Am J Obstet Gynecol* 1993; 17(4): 944-948.
7. Taylor RN, Musci TJ, Kuhn RM, Roberts JM. Partial characterization of a novel growth factor from the blood of women with preeclampsia. *J Clin Endocrinol Metab* 1990;70: 1285-91.
8. Akgül C, Salmayenli N, Ibrahimoglu L. Plasma fibronectin levels and preeclampsia. *Int J Gynec Obstet* 1994; 44(3): 280-281.
9. Altchek A. Renal biopsy and its clinical correlation in toxemia of pregnancy. *Circulation* 1964; 30: 11-43.
10. Mozdzien G, Schininger M, Zazgornik J. Kidney function and electrolyte metabolism in healthy pregnant women. *Wien. Med. Wochenschr* 1995;145:12-17.
11. Wakwe VC, Abudu OO. Estimation of plasma uric acid in pregnancy induced hypertension (PIH). Is the test still relevant? *Afr J Med Med Sci* 1999; 28 (3-4):155-58.
12. Hawkins TL, Roberts JM, Mangos GJ, Davis GK, Roberts LM, Brown MA. Plasma uric acid remains a marker of poor outcome in hypertensive pregnancy: a retrospective cohort study. *BJOG* 2012; 119(4):484-92.
13. Mustaphi R, Gopalan S, Dhaliwal L, Sarkar AK. Hyperuricemia and pregnancy induced hypertension—reappraisal. *Indian J Med Sci* 1996; 50 (3):68-71.
14. Hickman PE, Michael CA, Potter JM. Serum uric acid as a marker of pregnancy-induced hypertension. *Aust N Z J Obstet Gynaecol*. 1982; 22 (4):198-202.
15. Salako BL, Odukogbe AT, Olayemi O, Adedapo KS, Aimakhu CO, Alu FE, et al. Serum albumin, creatinine, uric acid and hypertensive disorders of pregnancy. *East Afr Med J* 2003; 80(8):424-28.