Serum uric acid level in normal pregnant and preeclamptic ladies: a comparative study

Pramanik T,[1] Khatiwada B [2], Pradhan P [3]

[1]Department of Physiology, Nepal Medical College, Jorpati, Katmandu, Nepal, [2]Deulekh, PHC, Bajhang, Nepal, [3] Department of O&G, Nepal Medical College and Teaching Hospital, Jorpati, Katmandu, Nepal

Corresponding author: Dr. Tapas Pramanik, Associate Prof., Dept. of Physiology, Nepal Medical College, Kathmandu, Nepal. Email: drpramanik@hotmail.com

ABSTRACT:

Preeclampsia is a serious pregnancy complication characterized by hypertension, proteinuria with or without pathological edema. According to some studies, serum uric acid lacks sensitivity and specificity as a diagnostic tool whereas another group of the researchers indicated uricemia as a predictor of preeclampsia in pregnant ladies. The present study was designed to assess whether serum uric acid can be used as a biochemical indicator or not in preeclamptic patients. Pre-eclamptic patients admitted in Nepal Medical College Teaching Hospital from June 2012 to June 2013 were included in this study. Age matched normal healthy pregnant ladies served as control. The record of their blood pressure and serum uric acid level was evaluated. Results showed significantly high blood pressure [SBP 149.42±12.35 vs 109.00±7.93 mm Hg; DBP 96.85±8.32 vs 72.5±7.10 mm Hg], and serum uric acid level [6.27±1.37 vs 4.27±0.61 mg/dl] in pre-eclamptic patients compared to their healthy counterparts. Uric acid is a terminal metabolite of the degradation of nucleotides, which increases their blood levels in patients with preeclampsia increasing its synthesis by damage and death of trophoblastic cells and proliferation. Uricemia in preeclampsia likely results from reduced uric acid clearance from diminished glomerular filtration, increased tubular reabsorption and decreased secretion. Results of the present study indicated association of elevated serum uric acid level with preeclampsia which could be used as a biochemical indicator of preeclampsia in pregnant women.

Key words: preeclampsia, serum uric acid

INTRODUCTION:

Preeclampsia is a serious pregnancy complication. It is a multi-system disorder characterized by hypertension (blood pressure ≥140/90 mm Hg), proteinuria (24-hr urinary protein ≥ 0.3g) with or without pathological edema, beyond 20th week of gestation in previously normotensive and non-proteinuric woman. This pregnancy specific syndrome can affect virtually every organ system.[1] Gestational hypertension is a common first clinical presentation of preeclampsia. Preeclampsia is associated with uricemia.[2] Nevertheless; some studies reported that uricemia is not a consistent predictive factor of preeclampsia.[3] Another study showed no significant difference in serum uric acid level between normal and mild preeclamptic women.[4] Furthermore, Lim *et al* reported serum uric acid has been found to lack sensitivity and specificity as a diagnostic tool,[5] whereas most of the researchers indicated uricemia as a predictor of preeclampsia.[6] The present study was designed to assess/evaluate whether serum uric acid could be used as a biochemical indicator in preeclamptic patients. For this purpose, the serum uric acid level was estimated in pregnant women with and without preeclampsia admitted in Nepal Medical College Teaching Hospital.

MATERIALS AND METHODS

The present study is a case control one. The data of Pre-eclamptic patients admitted in Nepal Medical College Teaching Hospital from June 2012 to June 2013 was taken for this study. Pregnant ladies with blood pressure ≥140/90 mm Hg [taken on at least two occasions 6 hours apart7] and proteinuria [24-hr urinary protein ≥ 0.3g or dipstick +1 or more7] beyond 20th week of gestation were considered as pre-eclamptic clinically. Within the aforesaid period 35 cases (n=35) of pre-clapsia were admitted. Age matched normal/healthy pregnant ladies served as control (n=20). Patients with the history of urinary tract infection, renal disease, diabetes mellitus and dehydrated patients were excluded in this study. Verbal consents of the patients were taken before the collection of blood by venipuncture for diagnostic purpose. The records of their blood pressure and serum uric acid level were evaluated. Results were compared and analyzed statistically by using student's t test.[8]

RESULTS

The number of pre-eclamptic patients was 35 with age ranging from 19-38 years (mean 28.11years). The range of blood pressure recorded in them was 140/90 mm Hg to 190/120 mm Hg. The number of normal pregnant ladies was 20 with age ranging from 19-30 years (mean

22.65 years). The range of blood pressure recorded in them was 90/58 mm Hg to122/88 mm Hg.

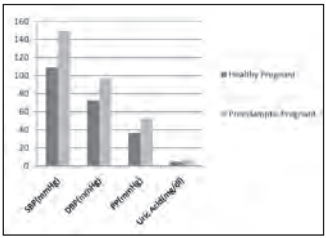

Fig. 1 Blood pressure and uric acid level in preeclamptic patients and healthy pregnant ladies.

Results presented in table-1 and fig-1. indicated significantly high blood pressure in pre-eclamptic patients compared to healthy pregnant ladies [SBP 149.42±12.35 vs 109.00±7.93 mm Hg; DBP 96.85±8.32 vs 72.5±7.10 mm Hg] Serum uric acid level was also significantly high in pre-eclamptic patients compared to their healthy counterparts [6.27±1.37 vs 4.27±0.61 mg/dl] (Table-1)

DISCUSSION:

Although the number of pre-eclamptic patients in the chosen study period was 35, the number of normal pregnant ladies that served as control was limited to 20, as the uric acid level in most of the normal pregnant ladies was found to be consistently within normal lower range (about 4 mg/dl in our study). Punthumapol and Kittichotpanich(2008) also compared uric acid levels of 68 pre-eclamptic patients with 36 normal pregnant women.4 Present study recorded high level of serum uric acid level in preeclamptic patients (6.27 mg/dl vs 4.27 mg/dl) which corroborated the findings of previous study. [9]

High blood pressure (≥140/90 mm Hg), proteinuria (24-hr urinary protein ≥ 0.3g) and/or pathological edema, beyond 20th week of gestation in previously normotensive and non-proteinuric woman are the characteristic features of preeclampsia.

Present study recorded elevated blood pressure (149.42/96.85 mmHg) in preeclamptic patients, whereas blood pressures in normal pregnant ladies were within normal range (109.00/72.50 mm Hg).

Constant high blood pressure increases the level of vasoconstrictors like thromboxane A_2, angiotensin II, endothelium I and decreases the level of vasodilators like prostaglandin I_2, prostaglandin E2, NO etc.[10] As a result, there was increase in peripheral resistance and further increase of blood pressure.

Endothelial dysfunction in preeclampsia increases capillary permeability leading to edema. Proteinuria due to leakage of protein from glomerular capillaries causes loss of protein resulting in decreased plasma colloidal osmotic pressure. Reduced plasma colloidal osmotic pressure causes edema in the victims of preeclampsia.

As mentioned earlier, present study recorded high level of serum uric acid level in preeclamptic patients (6.27 mg/dl vs 4.27 mg/dl). Uric acid is formed by the breakdown of purines and by direct synthesis from 5-phosphoribosyl phosphate (5-PRPP) and glutamine. The normal blood uric acid in humans is approximately 4 mg/dl. In the kidney, uric acid is filtered, reabsorbed and secreted. Normally, 98% of the filtered uric acid is reabsorbed and the remaining 2% makes up approximately 20% of the amount excreted. Remaining 80% comes from the tubular secretion.[11,12]

Uric acid is a terminal metabolite of the degradation of nucleotides, which increases their blood levels in patients with preeclampsia-eclampsia, increasing its synthesis by damage and death of trophoblastic cells and proliferation.[13]

In pre-ecalamptic patients significant increase of pulse pressure was noticed (52.57 mm Hg vs 36.50mm Hg). Elevation of pulse pressure has shown to induce endothelial dysfunction in small vessels and is a possible antecedent of atherosclerosis.[14] It indicated reduction in arterial compliance.[15] Elevated pulse pressure indicates hyperdymanic circulation that exerts more shearing force of blood on endothelium causing loss of more endothelium. Metabolism of this nucleoprotein of shredded endothelium may produce more uric acid.

Table-1: Blood pressure and uric acid level in preeclamptic patients and healthy pregnant ladies

Volunteers	SBP (mmHg) Mean ± SD	DBP (mmHg) Mean ± SD	PP (mmHg) Mean ± SD	Uric Acid (mg/dl) Mean ± SD
Healthy pregnant (n=20)	109.00±7.93	72.50±7.10	36.5±7.07	4.27±0.61
Preeclamptic pregnant (n=35)	149.42±12.35*	96.85±8.32*	52.57±7.41*	6.27±1.37*

* = $p \leq 0.05$; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; PP = Pulse Pressure

Uricemia in preeclampsia likely results from reduced uric acid clearance from diminished glomerular filtration, increased tubular reabsorption and decreased secretion.1 Hyperuricemia in preeclampsia was once thought to result solely from reduced renal clearance, but levels of uric acid are now also thought to increase through increased uric acid production caused by trophoblast breakdown, cytokine release and ischemia. Uric acid can promote endothelial dysfunction, damage and inflammation, which leads to oxidation. 3

Results of the present study indicated that preeclampsia is associated with elevated serum uric acid level which could be used as a biochemical indicator of preeclampsia in pregnant women.

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