

# SERUM CALCIUM, UREA AND URIC ACID LEVELS IN PRE-ECLAMPSIA

Pages with reference to book, From 183 To 185

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## ABSTRACT

Serum calcium, urea and uric acid levels were determined in 100 normal pregnant women and 50 patients with pre-eclampsia. Serum calcium levels were significantly lower and urea and uric acid levels higher in pre-eclampsia. Low levels of calcium were found as early as 28 weeks and can therefore be used for early diagnosis of pre-eclampsia. (JPMA41: 183, 1991).

## INTRODUCTION

Pre-eclampsia is a common obstetric disorder characterised by hypertension and proteinuria. It is associated with a higher foetal risk than non-proteinuric hypertension of pregnancy. Mild, or even barely recognisable pre-eclampsia may progress to eclampsia which is potentially lethal for both the mother and foetus<sup>1</sup>. Its incidence is gradually declining in the West with effective efforts<sup>2</sup>. Although no single clinical feature of preeclampsia is pathognomonic for the disease, some studies have shown a correlation between certain biochemical parameters and pre-eclampsia<sup>3-5</sup>. These include altered blood levels of calcium, urea and uric acid. This case control study was designed to establish whether such a relationship existed between these parameters and pre-eclampsia among our subjects.

## PATIENTS AND METHODS

Fifty patients with pre-eclampsia and 100 normal pregnancy women attending antenatal clinic were studied. To exclude cases with mistaken diagnosis, the stringent criteria used for selection of cases were, nulliparity, proteinuria, reliable history of cardiovascular and renal normality or better follow-up studies proving it, normal fundoscopic findings to exclude long standing hypertension, age less than 35 years, no history of cortisone or hormone therapy and an acute rise of blood (>20mm of Hg) above the previously existing diastolic pressure or a blood pressure of >140/90 mm of Hg at or after 20 weeks of pregnancy.

Controls were matched for age, parity and gestational age. Gestational age was calculated by dates (from last normal menstrual period) and ultrasound measurements in first half of pregnancy. Following criteria were adopted for the selection of controls. Blood pressure always <140/90mm of Hg or arise, if any, always <20mm Hg above the previously existing diastolic pressure, no proteinuria, no asymptomatic bacteriuria, no associate disease and no complication of pregnancy.

All subjects included in the study were recorded on a specially designed proforma, which included detailed history, complete physical examination including postural change in blood pressure.

Midstream urine was checked for proteinuria and bacteriuria to ensure absence of infection. Women with asymptomatic bacteria were excluded from the study. Blood was collected by clean vein puncture for biochemical tests. Estimation of blood, calcium urea, uric acid and creatinine was done by kit-method. Serum calcium was estimated using methyl blue, and 8-hydroxy quinoline<sup>6</sup>. Serum creatinine estimation was done to establish normality of renal function.

## Statistical methodology

Postural change in diastolic blood pressure of >20 mm at Hg among subjects was tested by Odd's ratio<sup>7</sup>.

## RESULTS

Mean age of subjects was 22 years (range 18-28); gestational age 36 weeks (range 28-40) and 19 cases (38%) were 28-34 weeks of pregnancy. Body weight of cases (61 kg) was significantly higher as compared to that of controls (58 kg) (Table I).

**TABLE I. AGE & weight of cases and controls.**

Parameters	Cases	Controls	P.value
	(50)	(100)	
	X ± SD	X ± SD	
Age (Yrs)	22 ± 3	22 ± 3	
Range	18-28	18-28	
G. Age (Wks)	36 ± 3	36 ± 3	
Range	28-40	28-40	
Weight (Kg)	61 ± 8	58 ± 8	< 0.05
Range	55-88	41-60	

Supine pressure response (rollover test) was positive in cases with a change in diastolic blood pressure ranging from 10-38mm Hg (Table II).

**TABLE II. Difference in B.P. in supine & lateral position.**

Blood Pressure	Cases		Control	
	Supine	Lateral	Supine	Lateral
	X ± S.D. (Range)	X ± S.D. (Range)	X ± S.D. (Range)	X ± S.D. (Range)
Systolic	146 ± 15 (110-180)	131 ± 15 (100-170)	108 ± 10 (90-130)	108 ± 10 (90-130)
Diastolic	106 ± 10 (90-140)	89 ± 12 (70-130)	72 ± 8 (60-90)	72 ± 7 (60-90)
Difference	18 ± 4 (10-30)			
P < 0.001				

Serum values of calcium, urea, uric acid and creatinine are given in Table III.

**TABLE III. Biochemical parameters.**

Parameters	Cases	Control	P. Value
	(50)	(100)	
	X ± S.D.	X ± S.D.	
Calcium (mmo1/L)	1.74 ± 0.8	1.92 ± 0.8	
Uric acid (mmo1/L)	340 ± 131	241 ± 94	<0.001
Urea (mmo1/L)	6.3 ± 4.5	4.1 ± 2.4	<0.001
Creatinine (mmo1/L)	69 ± 25	64 ± 22	

Serum calcium was comparatively lower and urea and uric acid significantly higher in cases. Serum creatinine was within normal limits in subjects showing normality of the kidney function.

## DISCUSSION

Recently much attention has been paid to relationship between serum calcium and blood pressure by various workers<sup>8-10</sup>. A casual relationship between serum calcium deficits and edema, proteinuria and hypertension gestosis and also beneficial effect of calcium supplementation on blood pressure has been reported in pregnant women<sup>4,12</sup>. Hypocalciuria distinguishes preeclampsia from normal pregnancy and other forms of more benign gestational hypertension<sup>13</sup>. The hypothesis of serum calcium and blood pressure relationship during pregnancy is corroborated by our findings of low serum, calcium in cases of pre-eclampsia (Table III). The exact mechanism involved in inverse relationship between serum calcium and blood pressure is not clearly understood. Probably the effect of calcium is interconnected with the effect of sodium. The natriuretic hormone influences membrane permeability and leads to an increase in intracellular sodium. It also inhibits sodium -calcium exchange and causes accumulation of calcium in vascular smooth muscle cells. The increase in intracellular calcium would lead to an increased contractility and vascular tone resulting in an augmented peripheral vascular resistance and consequently in raised blood pressure<sup>3</sup>. Recently parathyroid (PTH) hormone is believed to be involved in this relationship. Increase in PTH in serum would lead to an increase of free intracellular calcium which in vascular smooth muscles affects the tension and triggers muscular contraction resulting in increased blood pressure<sup>12,14</sup>. Blood urea and uric acid were significantly higher among our cases as compared to controls (Table III). These findings are similar to those reported for European women'. Topozado<sup>15</sup> describes raised blood urea during pregnancy as a known feature of pre-eclampsia. Rollover test, a predictor of pre-eclampsia, was positive in our cases but not in controls. Well controlled fellowship studies may prove this test to be an important predictor of pre-eclampsia among our subjects also.

From biochemical difference among our cases of pre-eclampsia and controls an important query arises; "Will calcium supplementation during pregnancy prevent the onset of pre-eclampsia?" Some workers<sup>12-18</sup> have demonstrated, by a series of randomized clinical trials, a reduction in blood pressure with calcium supplementation in animals, in healthy and mildly hypertensive subjects, and in pregnantwomen.

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