

Study of Random Urinary Calcium – Creatinine Ratio in Prediction of Pre-Eclampsia

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Abstract- Pre-eclampsia is defined as development of hypertension and proteinuria (> 300mg urinary protein in 24 hrs.) after 20th week gestation. Hypertension is defined as blood pressure greater than 140/90 mm Hg or a rise in blood pressure of 30/15 mm Hg from the baseline confirmed by two measurements 6 hrs. apart. The objective of the study is to estimate urinary Calcium-Creatinine ratio in cases of preeclampsia.

Urinary Calcium (10.53+ 3.12mg/dl),Urinary Creatinine (50.38+7.92 mg/dl),Urinary Calcium –Creatinine ratio (0.14 + 0.02) was determined in a spot urine sample in 50 Preeclamptic women as well as asymptomatic pregnant women after 20 weeks of gestation, who attended the antenatal OPD at Basaveshwara Medical College and Hospital. In preeclampsia, It is noticed that Urinary Calcium, Urinary Creatinine and Urinary Calcium : Creatinine ratio is significantly decreased . Extensive changes is seen in the renal system in pre-eclampsia. As a part of the end organ pathology, pre-eclamptic glomeruli undergoes structural changes with pronounced endothelial vacuolization and hypertrophy of the cytoplasmic organelles, first defined as glomerular endotheliosis.

A Case- Control Comparative study was done with Preeclamptic pregnant and normal pregnant women both from out patient and in patient of Basaveshwara Medical College Hospital and Research Centre, Chitradurga, according to the criteria .

Index Terms- Pre eclampsia, Urinary calcium, Urinary Creatinine, Urinary Calcium/ Creatinine ratio

I. INTRODUCTION

Pre-eclampsia is defined as development of hypertension and proteinuria (>300 mg urinary protein in 24hrs.) after 20th week gestation. Hypertension is defined as a blood pressure greater than 140/90 mm Hg or a rise in blood pressure of 30/15 mmHg from the base line confirmed by two measurements 6 hrs. apart¹ .

Pre-eclampsia is a leading cause of maternal and perinatal morbidity and mortality worldwide. Early diagnosis and treatment helps to reduce it to a minimum and therefore the importance of identifying the women at risk.Preeclampsia occurs in about 5-7 % of pregnancies. It is known to affect the function of various organs involving metabolism. The most important feature in toxemia of pregnancy is hypertension which is supposed to be due to vasospastic phenomenon in kidney, uterus, placenta and brain .

Many studies have been conducted to rule out the etiology. Early screening and diagnostic tests like lipid profile, oxidant and antioxidant status etc. but among these, serum and urine calcium levels and calcium metabolism have been studied extensively in Preeclampsia and various conflicting results are given. These studies were conducted to know alterations in Serum and Urinary calcium levels in all PIH cases including Preeclampsia .

Renal function changes are seen in symptom free women in whom preeclampsia will eventually develop. Regulation of intracellular calcium plays a key role in prevention of preeclampsia in the pregnant women. Pregnant women who develop severe preeclampsia have significant low dietary calcium intake compared to normotensive women. A calcium supplement has been hypothesized to reduced chances of PIH and pre-eclampsia .

II. MATERIALS AND METHODS

a) Inclusion Criteria

50 pregnant women at period after 20 weeks of gestation both from out patients and in patient of Basaveshwara Hospital who were following up with their with regular antenatal checkups, followed with regular routine blood and Urine investigations –i.e. Hb, RBS, VDRL, urine routine examination for protein, sugar, pus cells, epithelial cells are examined.

b) Exclusion criteria

Pregnant women who are previously known diabetic, hypertensive and suffering from any major illness (mainly renal and hepatic) are excluded from the study

Methods:-

Study group will be followed up every four weeks from 28th week of gestation and spot urine sample was collected for Biochemical evaluation of urinary Calcium and Creatinine. Urinary Calcium and Urinary Creatinine were estimated by Erba's Semi autoanalyzer. Urinary Calcium was estimated by Arsenazo Dye method and Urinary Creatinine was estimated by Jaffe's method.

The results were statistically analysed with Students "t-test". A case control comparative study was done with Preeclampsia and normal pregnant women accordingly to the criteria.

III. RESULTS & DISCUSSION

The present study included a total number of 100 subjects consists of 50 Pre eclamptic cases and 50 normal pregnant women.

Table-1: The Urinary Calcium, Creatinine, Calcium-Creatinine ratio in Preeclamptic women and normal Pregnant women.

| Groups | Urinary Calcium (mg/dl) | Urinary Creatinine (mg/dl) | Urinary Calcium/Creatinine Ratio |
|---|-------------------------|----------------------------|----------------------------------|
| Preeclamptic Women (n=50) [cases] | 10.53+3.12*** | 50.38 + 7.92** | 0.14+ 0.02*** |
| Normal pregnant Women (n=50) [controls] | 26.30+ 5.24** | 83.34 + 17.49** | 0.33+ 0.06** |

Note:-

- 1.The number in parenthesis shows the number of samples.
2. Values are expressed as their Mean ± SD.
3. p value * p<0.05, ** p<0.01, *** p<0.001.

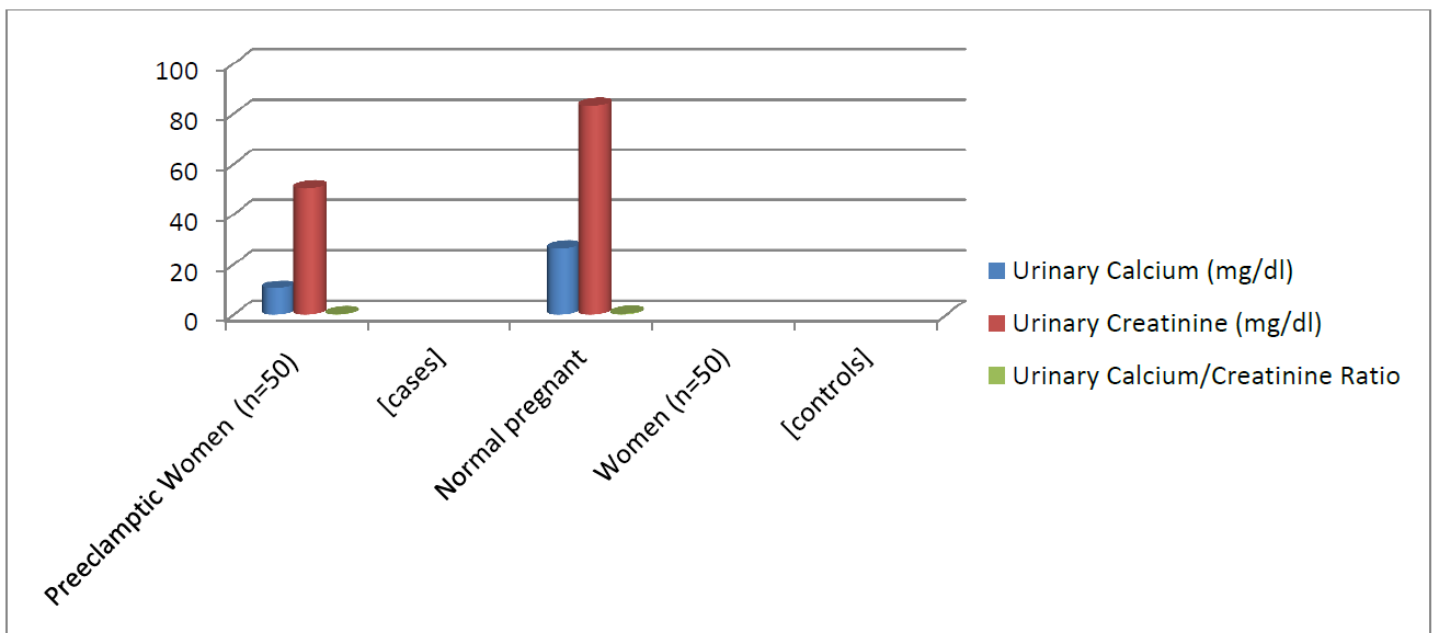


Figure I :- Comparison of Urinary Calcium, Creatinine , Calcium-Creatinine ratio in Preeclamptic women and normal Pregnant women.

The predominant pathology in preeclampsia is endothelial dysfunction which sets as early as 8-18 weeks, however signs and symptoms appear as late as in third trimester .To prevent the occurrence of preeclampsia, various predictors have been proposed.

Here, in Table-1 it shows a comparative study between Preeclampsia and normal pregnant women with parameters of Urinary Calcium, Urinary Creatinine , Urinary Calcium/ Creatinine Ratio.

It is seen that the Urinary Calcium in Preeclampsia cases is significantly decreased (p<0.01) as compared to normal pregnant women. Halhali A, Szmidt- Adjide Segovia B. L. et al have

reported that hypocalciuria was associated with preeclampsia and could be considered a risk factor for development of preeclampsia in pregnancy^{2,3}. Sanchez Ramos et. al.⁴ , Taufieldet. Al⁵ have reported decreased calcium in third trimester of PIH cases. Bilgin et.al.⁶ have reported hypocalciuria in cases of PIH compared to normal pregnant women .Ramos et.al.⁷ reported that 24 hour Calcium < 100mg may confirm suspected case of preeclampsia.

The urinary Creatinine level in Pre eclamptic cases is decreased as compared to (p<0.01) normal pregnant women. Urinary Creatinine is also selected as its value is almost constant whole day in excretion by urinary route.

The mean level of Urinary Calcium : Creatinine ratio shows statistically significant and decreases ($p < 0.001$) in Preeclampsia cases as compared to control group. Ozcan et al⁸ who investigated the predictive value of decreasing calcium to creatinine ratio in a spot urine sample as early as in 1995 reported that it might be an effective marker for preeclampsia. Saudan⁹, has reported a sensitivity of only 68% and specificity of 70% and Izumi et al¹⁰ found that it had limited value in prediction of preeclampsia, but the threshold value used was 0.10 by the former and Izumi et al carried out the test in early pregnancy, at less than or equal to 12 weeks of gestation. Kazerooni¹¹ evaluating between 20-24 weeks of gestation and Karetal¹² evaluating the predictive value of CCR at less than or equal to 0.04 between 20-34 weeks of gestation (similar to our study), have reported that it was a satisfactory test for prediction of preeclampsia and could be an effective method for screening asymptomatic women for preeclampsia. Rodriquez et al¹³ evaluated the role of decreasing calcium creatinine ratio and micro albuminuria in prediction of preeclampsia as early as in 1988 and have concluded that these tests may be useful screening tools in prediction of preeclampsia.

IV. CONCLUSION

Preeclampsia is a major cause for concern worldwide and there has been a constant search to find means for prediction and prevention. An availability of a good screening test would initiate more research in this direction and would ultimately pave the way for implementation of measures for primary prevention. Estimation of Calcium -Creatinine ratio in a spot urine sample is a simple test, easily performed hence assures patient compliance. It has a good predictive value and justifies the cost and is suited to be adopted as a screening tool for preeclampsia. It can therefore be recommended as a screening test for preeclampsia and could be offered to all asymptomatic pregnant women between 20-24 weeks of gestation during their routine antenatal visit.

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