

ROLE OF CALCIUM THERAPY ON URINARY CALCIUM/CREATININE RATIO IN HELTHY PREGNANT WOMEN AND PRE-ECLAMPTIC WOMEN

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ABSTRACT

The study has been carried out to observe the effect of calcium therapy on urinary calcium/creatinine ratio in healthy gravid women and pre-eclamptic women. Calcium/creatinine ratio has been considered for early detection of pre-eclamptic toxemia (PET). So for the diagnosis of PET we try to investigate relation of urinary calcium, urinary creatinine, urinary calcium/creatinine ratio before and after calcium therapy. For this purpose total number of 60 healthy gravid and clinically suspected PET women of 20-28 weeks of pregnancy having age ranged from, 17-39 years were selected. Of these 30 healthy pregnant women were taken as control group and another clinically diagnosed 30 PET women were taken as observational group. Urinary calcium/creatinine ratio was within normal range in healthy pregnant women and after calcium therapy this ratio was not significantly changed. On the other hand urinary calcium/creatinine ratio in PET women was significantly decreased and this ratio was significantly increased after calcium therapy. These observations suggest that low calcium/creatinine ratio help in early prediction of PET and calcium supplement during pregnancy may reduce the incidence of PET.

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INTRODUCTION

Pre-eclampsia (PET) is a triad of oedema, hypertension and proteinuria occurs mostly in nullipara after 20th week of gestation and most frequently near term.¹ National basis, incidence of pre-eclampsia is still very high and the most common medical disorder that occurs during pregnancy.² In spite of different preventive approaches to improve obstetrics care in Bangladesh it constitutes about 5% of total deliveries and 16% of the maternal mortality which is equivalent of about 4500 women/year.^{2,3}

Clinical sign of pre-eclampsia is considered to be late manifestation of a disease that has been present since the first trimester of gestation, many workers have studied different biochemical parameters during normal pregnancy for early detection of pre-eclampsia but the result and interpretation are not convincing.^{4,5,6,7,8}

Empirically many gynecologists give calcium supplement to pregnant women, especially in suspected cases of pre-eclampsia. Calcium supplement during pregnancy may reduce the incidence of pre-eclampsia which was suggested by many worker.^{8,9,10} It has been found that increase in urinary albumin and decrease in calcium excretion may be an early marker for pre-eclampsia¹⁰. Urinary calcium/creatinine ratio less than or equal to 0.04 which may be an early marker for useful screening tool in predicting the subsequent development of pre-eclampsia^{11, 12}.

So determination of calcium/creatinine ratio may easily predict the case of PET. Because previously it was reported that 24 hours urine sample can be replaced by

a single voided urine.^{12,13,14} But no data is available on this aspect in our country.

Therefore present study has been carried out to evaluate the effect of calcium therapy on urinary calcium/creatinine ratio in pre-eclamptic women in our country.

MATERIALS AND METHODS

This is a non-interventional case control study that was carried out on total number of 60 women with age ranged from 17-39 years of them 30 healthy gravid women were taken as control and 30 PET women were taken as observational group.

All the subjects were selected from department of obstetrics & gynecology, out door & indoor, Rajshahi Medical College Hospital. A complete obstetrical history, clinical examination and necessary investigations were done to exclude other conditions affecting urinary calcium/creatinine ratio. All the subjects were taken from middle and lower middle socioeconomic classes.

The suspected PET women those who had lower urinary calcium/creatinine ratio were supplemented by calcium tablet (1gm/day) for 1 month.^{15, 16}

Urinary calcium, urinary creatinine and urinary calcium/creatinine ratio were determined by using reagent kits Human & Tradesworth germany. Calcium was measured by o-cersolpthelein complexions method & creatinine was measured by alkaline picrate method of Jaffe.^{17, 18} The significance of differences between two groups was calculated using unpaired student's t test.

RESULTS

In case of healthy pregnant women (control group) urinary calcium, urinary creatinine and urinary calcium/

Table
Biochemical Result of Urinary Calcium, Urinary Creatinine and Urinary Calcium/Creatinine ratio

Biochemical parameters	Calcium therapy (n=30)				P value < 0.001*** 0.05*
	Before		After		
	Mean	±SEM	Mean	±SEM	
Group I (control group)					
Urinary Calcium mg/dl	6.239	± .159	12.691	± .536	NS
Urinary Creatinine mg/dl	33.515	± 2.717	81.190	± 8.200	NS
Urinary Calcium/creatinine ratio	.231	± .025	.200	± .012	NS
Group II (observational group)					
Urinary Calcium mg/dl	2.581	± .287	6.924	± .321	***
Urinary Creatinine mg/dl	70.454	± 10.791	36.047	± 2.755	NS
Urinary Calcium/creatinine ratio	.136	± .088	.226	± .020	***

creatinine ratio were (mean±SEM) 6.239±0.159 mg/dl, 33.515±2.717 mg/dl and 0.231±0.025 respectively before calcium therapy. After calcium therapy, urinary calcium, urinary creatinine and urinary calcium/creatinine ratio were 12.691±0.536 mg/dl (mean±SEM) 81.190±8.200 mg/dl and 0.200±0.012 respectively. Calcium therapy did not produce any significant change in calcium/creatinine ratio.

In case of pre-eclamptic women (observational group) urinary calcium, urinary creatinine and urinary calcium/creatinine ratio were (mean±SEM) 2.581±0.287 mg/dl 70.454±10.791 mg/dl and 0.136±.088 respectively before therapy. After calcium therapy urinary calcium, urinary creatinine and urinary calcium/creatinine ratio were (mean±SEM) 6.924±0.321 mg/dl 36.047±2.755 mg/dl and 0.226±0.020 respectively. Calcium therapy produced highly significant ($P<0.001$) increase in calcium/creatinine ratio. So calcium therapy was found to have a positive role for prevention of pre-eclampsia.

DISCUSSION

The present study has been designed to observe the role of calcium on urinary calcium creatinine ratio in healthy pregnant and PET women. PET patient have been shown to excrete less calcium in urine. Several studies have used the predictive value of hypocalciuria for pre-eclampsia.^{4,5,11,12,19,20,21,22}

In healthy pregnant women (control group) urinary calcium /creatinine ratio was increased after calcium therapy (1gm/day for 1month) but the change was not statistically significant. This finding is in agreement with another study.^{8,9} In PET women (observational group) urinary calcium/creatinine ratio was significantly increased after calcium therapy (1gm/day for 1 month).

This finding is also well correlated with different workers' findings.^{6,20,21,22,23,24}

It was concluded that the urinary calcium/creatinine ratio differ significantly between healthy pregnant women and PET women. So it has been strongly suggested that a high dose calcium intake can correct calcium deficiency which is responsible for development of PET.

This study does not explain the exact mechanism of calcium excretion in urine in PET women. However the mechanism of calcium excretion can be suggested as follows. Large dose of calcium intake increases serum calcium level which lowers parathyroid hormone concentration and reduction of renal calcium reabsorption which ultimately causes increased urinary calcium excretion in PET²⁵. Early prediction of a high-risk pregnancy would allow designing close follow-up plans and calcium supplementation prevent the development of PET. Further studies are needed to clarify the significance of dietary calcium intake and the effectiveness of calcium therapy in PET women.

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