ROLE OF URINARY CALCIUM CREATININE RATIO IN THE PREDICTION OF PREGNANCY INDUCED HYPERTENSION

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SUMMARY

Pregnancy induced hypertension is a common disorder of pregnancy and a major cause of maternal, fetal and neonatal morbidity and mortality. It represents a state of profound physiopathological changes. One of the important biochemical alteration is a change in urinary calcium and creatinine ratio in the patients of PIH. The present study analyses the importance of this test as an early predictor for the development of PIH.

A total of 104 antenatal cases were studied and were divided into study group (64 cases) with high risk factor for development of PIH and control group (40 cases) without any high risk factors. PIH developed in 13.46% of all patients. Nulliparity is found to be a significant high risk factor. Urinary calcium creatinine ratio was ≤ 0.04 in 13.46% patients, out of which 71.4% patient developed PIH which was found to be statistically highly significant.

INTRODUCTION

Pre-eclampsia is a syndrome that develops usually at the end of pregnancy, during labour, or in the immediate puerperium. It is common, dangerous to both mother and baby, unpredictable in its onset and progression, and treatable only

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by terminating the pregnancy.

Pregnancy induced hypertension (PIH) is diagnosed when a woman with previously normal blood pressure shows a sustained rise of blood pressure to 140/90 mm of Hg or more on atleast two occasions, 6 hours apart, after the 20th week of gestation, in the absence of evidence of an underlying cause of hypertension.

In preventing this disorder, the most important limiting factor is its lack of timely prediction. Several methods have been proposed for identifying pregnant woman who are at risk of development of preeclampsia. These include the use of an angiotensin II pressor response, the roll-over test, the isometric hand grip exercise test and the Mean arterial pressor test. Because its pathogenesis is undefined, none of these methods has been proved as an ideal test for prediction of PIH either because of their complexity, the incidence of false positive results or the subjective nature of result interpretation.

The aim of this study was to assess the role of urinary calcium - creatinine ratio in the prediction of PIH.

MATERIAL AND METHODS

The present study was conducted at Department of Obstetrics and Gynaecology, Queen Mary's Hospital and PostGraduate Department of Pathology, K.G Medical College, Lucknow. The study was conducted on 104 patients either attending the routine antenatal clinic or admitted in Wards. All patients were registered between 24th to 34th weeks gestation and were divided into two groups : (a) Study Group : Comprised of 64 pregnant patients with high risk factors for development of PIH. (b) Control Group : Comprised of 40 normal pregnant patients.

Women were excluded from the study if they had history of chronic hypertension, diabetes, renal diseases or blood pressure $\geq$ 140/90 mm. Hg.

Their morning urine sample was collected in calcium free vials and analysed for urinary calcium & creatinine. The creatinine was estimated by Jaffe's method while the calcium was estimated by OCPC method. No dietary alterations were recommended. Patients were followed up with routine antenatal care and their outcome was noted.

Foetal outcome was noted in relation to mode of delivery, gestational age at birth, sex and weight of baby. All the collected data were reviewed and analysed to see the relationship of urinary calcium creatinine ratio & the development of PIH.

OBSERVATIONS

(Table I, II & III)

Table I
DISTRIBUTION OF TOTAL PATIENTS ACCORDING TO URINARY CALCIUM-CREATININE RATIO

Groups	CCR≤0.04		CCR>0.04	
	No.	%	No.	%
Study Group (n=64)	10	15.6	54	84.4
Control Group (n=40)	4	10.0	36	90.0

Table II
RELATIONSHIP OF CCR & DEVELOPMENT OF PIH

Groups CCR	PIH + nt		PIH - nt	
	No.	%	No.	%
CCR <0.04 (n=14)	10	71.4	4	28.6
CCR >0.04 (n=90)	4	4.4	86	95.6

DISCUSSION

Study comprised of total 104 patients, out of which 13.46% developed PIH. 10 patients who developed PIH had raised B.P. and protienuria along with the pedal oedema whereas 4 patients had raised B.P. along with protienuria. Mudaliar and Menon (1972) have reported an incidence of 7-10% in India. Rodriguez et al (1988) have reported an incidence of 10%.

Fourteen patients of the total 104 patients had urinary calcium creatinine ratio ≤ 0.04, out of which 71.4% developed PIH. Of the remaining

Table III
RELATIONSHIP OF CCR AND DEVELOPMENT OF PIH IN STUDY AND CONTROL GROUP

	Calcium - creatinine ratio ≤0.04				Calcium - creatinine ratio >0.04			
Appearance of PIH	Control Group		Study Group		Control Group		Study Group	
	No.	%	No.	%	No.	%	No.	%
PIH Present	2	50	8	80	2	5.5	2	3.7
PIH Absent	2	50	2	20	34	94.5	52	96.3

patients, 4.4% developed PIH. When calcium-creatinine ratio alone is taken as a high risk factor for development of PIH,it was found to be highly significant (p=0.000000). 50 % of patients in whom PIH developed were primigravid. (Table IV & V)

Table V shows that if urinary calcium-creatinine ratio is ≤0.04 a patient at risk for development of PIH, then 80% of them developed pre-eclampsia later in pregnancy. If calcium-creatinine ratio is > 0.04 then 97.6% did not develop PIH. Upon statistical calculation, p=0.0000 by Fischer exact test, RR=33.60, and OR=164.

This shows that low calcium-creatinine ratio in a high risk patient is a very strong factor development of PIH later in pregnancy.

The findings of various studies have been contradictory and inconsistant owing to a few factors. Firstly, the composition of the population screened varies among authors. Secondly, the terminology and definitions used to classify the hypertensive disorders of pregnancy vary among authors. Also, it was usually not stated whether or not women showing elevations of blood pressure occuring for the first time during labour or in the early post partum period were included as having IIDP.

Table IV
COMPARISON OF PREDICTIVE VALUE OF CALCIUM-CREATININE RATIO IN PRESENT STUDY WITH OTHER STUDIES IN REVIEW OF LITERATURE.

Author	Year	No. of Patients	Parity	HDP Incidence	Sensitivity %	Specificity %	PPV %	NPV %
Rodriguez et al	1988	88	>0	11	70	95	64	96
Sanchez Ramos et al	1991	99	0	8	88	84	32	99
Augustin-Agudelo et al	1994	445	0	13	33	78	5	97
Present	1996	104	≥0	13.46	71.4	95.5	71.4	95.5

TABLE V
RELATIONSHIP OF CCR AND DEVELOPMENT OF PIH IN STUDY GROUP

Appearance of PIH	CCR ≤0.04 (n=10)	CCR >0.04 (n=54)
PIH +nt	8	2
PIH -nt	2	52

In previous studies it is uncertain whether tests were assessed in a double blind fashion or not.

In the present study a few cases may have been missed because there are certain pitfalls in the measurement of renal function in third trimester of pregnancy.

Urine sample was collected in calcium free vials. Even a fraction

of a drop of tap water can cause marked alteration in reading due to its content. Regarding the mechanism of hypocalciuria, volume contraction and renal insufficiency in PIH could have contributed to hypocalciuria.

CONCLUSION

Following conclusions were drawn from the study :

1. PIH developed in 13.46% of all patients usually between 36 - 39th week gestation. 71.43% of patients developed PIH in form in form of oedema, proteinuria and raised B.P.

2. Nulliparity in comparison to history of PIH is previous pregnancy was found to be a significant factor (P=<0.05, OR= 16.33, Mcnemar's chi square test = 38.94) Nulliparity alone is a most important high risk factor for development of PIH as compared to other factors combined.

3. Urinary calcium creatinine ratio was <0.04 in 13.46 % patients, out of which 71.4% patients developed PIH which was found to be statistically highly significant. (P=0.0000; OR=53.75; Sensitivity = 71.4%; Specificity = 95.5%; PPV =71.4%; NPV=95.5%).

4. A pregnant patient with a high risk factor such as nulliparity along with low urinary calcium creatinine ratio is at a high risk for development of PIH.

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