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Study of Serum and Urinary Calcium Levels in Pregnancy Induced Hypertension Cases in and Around Chitradurga

Dr. G.Rudrappa[1], Sabitha Bai T[2] and Dinesh Javarappa[3]

[1] Basavehwara Medical College and Hospital,Chitradurga/ Rajiv Gandhi University of Health Sciences,Karnataka.

Received: 9 December 2013 Accepted: 4 January 2014 Published: 15 January 2014

Abstract

Pregnancy Induced Hypertension (PIH) is defined as multisystem disorder of unknown aetiology causing vasospasm and anoxia and there is a raised blood pressure recorded at least on two occasions at 6 hours apart. It is thought that preeclampsia develop when the pregnancy induced systemic response causes one or more maternal system to decompensate. The high foetal demand for calcium is facilitated by profound physiological interactions between mother and foetus. Biochemical changes in PIH are increased plasma Creatinine, urea and uric acid concentration with proteinuria due to renal glomerular endotheliosis leading to impaired glomerular perfusion and filtration.A case control comparative study was done with PIH and normal pregnant women both from outpatient and inpatient of Basaveshwara Medical College Hospital and Research Centre, Chitradurga, according to the criteria. Study group will be followed up every four weeks from 28th week of gestation and 24hour/random urine sample will be collected for Biochemical evaluation of urinary Calcium, Creatinine and protein.

Index terms— PIH, Urinary calcium, Creatinine, Protein and Protein/Creatinine ratio, serum uric acid.

1 Introduction

ypertension is one of the common complications met with pregnancy and contributes significantly to maternal and perinatal morbidity and mortality. There is generalised vasospasm leading to systemic disorders involving all the vital organs of the body. Severity of Hypertensive disease in pregnancy is controllable with proper management in most of the cases and mortality is avoidable. PIH is a term used to describe new hypertensions which appear after midterm pregnancy (20 weeks) and resolves after delivery. PIH is defined as raised blood pressure recorded at least on two occasions at 6 hours apart (2). It may be either diastolic >90 mm of Hg or systolic >140 mm of Hg. Preeclampsia is also associated with significant proteinuria >300 mg/ 24 hours (3).

Gestational hypertension shows an exaggerated B.P. reference detected first time after mid pregnancy without proteinuria. It is thought that preeclampsia develop when the pregnancy induced systemic response causes one or more maternal system to decompensate. In its clinical phase preeclampsia is a hypocalciuric state and it has been reported that hypocalciuria predicts preeclampsia (9). The pregnant women's body provides daily doses of 50-330 mg calcium to supports development of foetal skeleton (7). This high foetal demand for calcium is facilitated by profound physiological interactions between mother and foetus. Studies of blood calcium level during pregnancy found significantly decreases in total serum as pregnancy progressed (6). Regulation of intracellular calcium plays a key role in hypertension half of the pregnant women with hypertension have preeclampsia. 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 preeclampsia (16). Biochemical changes in PIH are increased plasma Creatinine, urea and uric acid concentration with proteinuria due to renal glomerular endotheliosis leading to impaired glomerular perfusion and filtration. Many studies have been conducted to rule

out the etiology , early screening and diagnostic tests, like lipid profile, oxidant and antioxidant status but among these serum and urine calcium levels and calcium metabolism have been studied extensively in PIH and preeclampsia and various conflicting results are given. Study is conducted to know alterations in serum and urinary calcium levels in all PIH cases of hypertension induced in pregnant women in and around Chitradurga.

2 II.

Materials and Methods a) Inclusion Criteria 50 pregnant women at period (18-20 weeks) of gestation both from out patients and inpatient of BMC 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.

3 b) Exclusion criteria

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

i.

Methods Study group will be followed up every four weeks from 28th week of gestation and 24hour/random urine sample will be collected for Biochemical evaluation of urinary Calcium (12), Creatinine (13) and protein by multiple strips (dipsticks) by Roche's Urine Analyser.

3 ml venous blood sample was collected from both PIH cases and normal pregnant women as per the criteria into plane vaccutainers. Blood samples are used for serum Calcium (12), serum Uric acid (14) and serum Creatinine (13). The results were statistically analysed with Students "test".

A case control comparative study was done with PIH and normal pregnant women accordingly to the criteria.

4 III.

5 Results

The present study included a total number of 100 subjects consists of 50 PIH cases and 50 normal pregnant women. The Urinary protein levels in PIH cases is significant increase ($p<0.001$) as compared to normal pregnant women. The proteinuria in PIH cases as compared to normal pregnant women is probably due to renal glomerular endotheliosis leading to impaired glomerular perfusion and filtration.

Total protein excretion in urine is considered as abnormal in pregnant women when it exceeds 300mg/24 hours.

The urinary creatinine levels in PIH cases decreased as compared to ($p<0.001$) normal pregnant women. GFR and renal blood flow raised markedly during pregnancy results in physiological fall in the serum Creatinine concentration. Urine protein excretion increases substantially due to combination of increased GFR, increased permeability of glomerular basement membrane. The protein/Creatinine ratio in PIH cases is marginally increased as compared to normal pregnant women. Thus the pathogenesis of hypocalciuria in PIH is controversial and theoretically may be due to decreased calcium uptake by the foetus and/or increased renal tubular absorption of calcium (5).

The serum uric acid levels are significantly increased ($p<0.001$) in PIH cases compared to normal pregnant women (Table -2) and this supports the theory of uric acid role in vascular damage and in oxidative stress, the renal lesion of glomerular endotheliosis is mostlikly caused by circulating anti endothelial factors such as soluble fms-like tyrosinekinase-1, it is conceivable that uric acid may synergise with soluble fms-like tyrosinekinase-1, to induce endothelial dysfunction also the afferent arteriolar disease is seen in individuals with PIH, which explains development of hypertension in PIH (4).

In this study, it was found that significant hypocalciuria was associated with preeclampsia, suggests that, calcium measurement may be useful in screening for the PIH cases.

Figure 1:

1

and Normal pregnant women

Parameter	Urinary Calcium (mg/dl)	Urinary Protein (gm/day)	Urinary Creatinine (gm/day)	Protein/Creatin ratio
Normal pregnant women (n=50)	390.42 ± 34.36	0.080 ± 0.026	1.29 ± 0.33	0.05 ± 0.03
PIH Cases (n=50)	342.92*** ± 52.1	0.333*** ± 0.13	0.76** ± 0.11	0.43* ± 0.17

Note: 1.The number in parenthesis shows the number of samples.
2. Values are expressed as their Mean ± SD.
3. p-value * $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Table -2 shows, the serum levels of Uric acid,
Calcium and Creatinine in PIH cases and compared with
normal pregnant women.

Figure 2: Table 1 :

2

Parameter	pregnant women Serum Uric acid (Mg/dl)	Serum Calcium (Mg/dl)	Serum Creatinine (Mg/dl)
Normal pregnant women (n=50)	5.62 ± 1.01	8.95 ± 0.88	0.80 ± 0.13
PIH Cases (n=50)	7.64*** ± 1.39	8.29** ± 0.47	0.898 ± 0.16

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 3: Table 2 :

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Figure 4: Table - 1

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