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To study the correlation between blood pressure, BMI, gestational age, serum calcium level in normal and pre eclamptic women

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Abstract

Aim and Objective: This is a case controlled study to see the relation of serum calcium (Sr Ca²⁺) level, blood pressure, BMI, gestational age in preeclampsics (PIH, n-50) and normal pregnant women (controlled group, n-50).

Material and method: A total of 100 pregnant women aged between 20-35 years from OPD & IPD of OBGY dept. who have satisfied inclusion and exclusion criteria and who have consented to participate in study were enrolled. Each enrolled subjects blood pressure (BP) was recorded and Sr Ca²⁺ was estimated from venous blood by Autoanalyzer.

Result: PIH group exhibited significant positive correlation between serum Ca²⁺ level with blood pressure and positive correlation between BMI and gestational age of PIH subjects.

Conclusion: In this study it has shown that decline serum Ca²⁺ level may have a role development of PIH and women at risk of developing PIH may be benefited by consuming additional dietary calcium.

Keywords: Preeclampsia, Hypertension, Serum calcium.

Introduction

PIH which occurs in 10% of pregnancies is a major risk factors for maternal and prenatal morbidity and mortality [1]. PIH is characterized by abnormal increase in blood pressure, proteinuria, and edema, usually developing after the 20th weeks of pregnancy [2].

Preeclampsia may start developing from 20th weeks of gestation. Its progress differs among pregnancies. Most cases are diagnosed preterm. Preeclampsia may also occur up to six weeks post-partum period.

Numerous studies are available linking preeclampsia with Sr Ca²⁺ level [3, 4, 5]. Describing whether calcium supplementation during pregnancy would effectively lower blood pressure and whether such treatment would have an effect on the incidence of preeclampsia and low birth weight [6, 7, 8].

For foetal skeleton development at least 50-330mg Ca²⁺ is required. This high foetal demand for calcium is facilitated by profound physiological interactions between mother and fetus [9]. Regulation of intracellular Ca²⁺ plays a key role in hypertension [10]. Ca²⁺ plays a critical role in function of the cardiac and vascular smooth muscle. Deficiency of Ca²⁺ may lead to irritable nervous. There is increase in parathyroid and renin hormone and intracellular calcium, leading to increase vascular smooth muscle contraction and increase blood pressure [11].

Calcium supplement has been hypothesized to reduce chances of pregnancy induced hypertension [12, 13]. Pregnant women developing preeclampsia have significant lower dietary calcium intake as compared to normotensive women [14].

With this background and encouraged by facts, present study is undertaken to find out the correlation between serum Ca²⁺, blood pressure, BMI, gestational age in PIH and normotensive womens.

Material and Methods

Study design: Present study is a hospital based case control study involving 100 subjects, normotensive pregnant women as controlled (n-50) group and PIH (n-50) group were enrolled.

Methods: Inclusion criteria included 1) Pregnant women age between 20-35 years 2) Primigravida 3) Normotensive and PIH women after completion of 20th weeks of gestational age. Exclusion criteria were women with 1) Multiparas 2) Family history and personal history of hypertension 3) Any other major diseases (cardiac, renal, diabetes, TB) 4) H/O smoking, addiction of tobacco and alcohol. Pregnant women of varied socioeconomic status were selected from OPD and IPD in OBGY Dept. of MGM Medical College, Aurangabad were enrolled. Informed and written consent was obtained from all enrolled subjects. Questionnaires included personal information's (age, no. of pregnancies, level of education, Ca²⁺ sources in diet) and Institutional ethical committee had cleared the project.

PIH was diagnosed based on high blood pressure (two separate readings taken at least six hours apart of 140/90 mmHg or more), proteinuria and with or without edema (on face and hands). Blood pressure was measured using a sphygmomanometer and proteinuria analysis was done by using standard procedure. With all aseptic precautions 3ml of venous blood sample was collected in plain blue. Serum Ca²⁺ was estimated using Auto analyzer Dimension RXL Max Machine (Siemens).

Statistical Analysis: To analyze data students 't' test was used. 'p' value less than 0.005 was considered significant, 'p' value more than 0.05 was considered non significant and 'p' value less than 0.01 was considered highly significant.

Results

100 women (PIH n=50) and (controlled n=50) who have satisfied the inclusion and exclusion criteria were selected.

Table 1: Comparative statistics: of BMI, gestational age, systolic BP, diastolic BP, proteinuria in controlled and PIH groups (SD- Standard deviation)

Characteristics	Groups	Mean ± SD	't' value	'p' value
Age(25-35yrs)	Controlled	28.62±2.29	2.08	0.05
	PIH	29.58±2.32		
BMI (Kg/m ²)	Controlled	23.08±1.80	0.87	0.65
	PIH	23.04±1.80		
Gestational age(weeks)	Controlled	31.50±2.12	0.87	0.65
	PIH	30.98±3.67		
Systolic BP(mm of Hg)	Controlled	129.28±8.01	11.35	0.0005
	PIH	170.68±13.34		
Diastolic BP (mm of Hg)	Controlled	79.84±4.48	24.24	0.0001
	PIH	103.36±5.2		
Serum Ca ²⁺ Level (mg %)	Controlled	8.98±0.37	1.35	0.005
	PIH	8.07±0.43		

Table-1 Mean age in years showed significant positive correlation. Mean gestational period in weeks and BMI were not statistically different in controlled and PIH groups. Systolic and diastolic blood pressures were highly significant. Higher in PIH group than controlled group. Serum Ca²⁺ in PIH group was significantly lower than controlled group.

Table 2: Correlation between Age, Sr.Ca²⁺, BMI, gestational age, systolic BP, diastolic BP in PIH group

	Age (Yrs)	Sr.Ca ²⁺ (mg%)	Systolic BP (mmHg)	Diastolic BP (mmHg)	Gestational Age (wks)	BMI Kg/m ²
Age (yrs)	1	0.040	0.125	-0.030	-0.031	0.033
Sr.Ca ²⁺ (mg%)		1	0.288	0.318	-0.056	-0.067
Systolic BP (mm Hg)			1	0.220	0.106	0.066
Diastolic BP (mm Hg)				1	0.013	0.287
Gestational age (weeks)					1	0.132
BMI Kg/m ²						1

Table-2 shows significant positive correlation between serum calcium level with systolic and diastolic BP. BMI showed

positive relationship with diastolic BP and gestational age of PIH

Table 3: Correlation between Age, Sr.Ca²⁺, BMI, gestational age, systolic BP, diastolic BP in controlled group

	Age (Yrs)	Sr.Ca ²⁺ (mg%)	Systolic BP (mmHg)	Diastolic BP (mmHg)	Gestational Age (wks)	BMI Kg/m ²
Age (yrs)	1	0.106	0.179	-0.021	-0.090	-0.254
Sr.Ca ²⁺ (mg%)		1	0.052	0.112	-0.008	-0.004
Systolic BP (mm Hg)			1	0.070	0.016	0.081
Diastolic BP (mm Hg)				1	0.192	0.354
Gestational age (weeks)					1	0.087
BMI (Kg/m ²)						1

Discussion

Our study has shown that the mean Sr Ca²⁺ of the PIH group was (8.07±0.43), while the SrCa²⁺ of the control group was (8.98±0.3). There was statistically significant difference in both groups p=0.005. This result matches previous data which suggest that an inverse relationship between calcium and incidence of PIH.

In PIH group there is a significant positive correlation between serum calcium level with systolic and diastolic BP. BMI showed positive relationship with diastolic BP. There

was positive correlation between BMI and gestational age of PIH subjects. Whereas in controlled group, serum calcium does not show correlation with BP or any other parameters. BMI is negatively associated with systolic BP and gestational age and positively associated with diastolic BP. On the basis of experimental findings, no precise mechanism has been established relating serum calcium levels with preeclampsia. However, several theories have been put forward. One of the possibility is that preeclampsia have a significantly lower 1, 25 – dihydroxyvitamin D, This lower

level may contribute to the suboptimal intestinal absorption of calcium during the time of increased calcium demand ^[14]. Further, low calcium intake results in high parathyroid hormone levels and increased membrane permeability, resulting in increased intracellular calcium levels and decreased serum calcium levels. The former triggers vascular smooth muscle contraction and contributes to increased blood pressure ^[15].

Conclusion

Our study showed in all parameters moderate to low variation among the normal as well as PIH subjects. Statistically significant increase in systolic and diastolic BP was observed in PIH than normal group. This was associated with significant decrease in Sr Ca²⁺ level in PIH than normal group. There was insignificant differences found in serum calcium levels with gestational age in weeks. <32wks and >32wks and in BMI in PIH group and control group. Suggesting that the low level of maternal Sr Ca²⁺ may have a role in development of PIH. Therefore, calcium consumption in pregnancy should be encouraged, especially during second and third trimester of pregnancy.

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