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Comparison of serum calcium levels between preeclamptic and normotensive pregnant women

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Abstract
Background: The purpose of this study is to compare mean serum calcium levels of pre-eclamptic and normotensive pregnant women.
Methods: The prospective study was conducted on 60 cases of antenatal patients in the third trimester (28-40 weeks of gestation) having age between 18-40 years. All selected cases will be divided into two groups: Cases (30 patients of hypertensive disorder in pregnancy). Control (30 normotensive patients).
Results: Both groups were comparable. Significant decrease in the level of serum calcium in the preeclamptic women (8.12±0.43 mg/dl) when compared with the normal pregnant women (9.12±0.51 mg/dl).
Conclusion: These findings support the hypothesis that hypocalcaemia are possible etiologies of preeclampsia.

Keywords: preeclampsia, calcium, women

Introduction

Till date the only proven way to prevent development as well as severity of hypertensive disease in pregnancy (HDP) is calcium supplementation. Calcium supplementation during pregnancy is known to decrease incidence as well as severity of gestational hypertension, pre-eclampsia, eclampsia and also neonatal morbidity and mortality, as well as pre-term births, especially in developing countries, although the impact varies according to the baseline calcium intake and other prevailing risk factors in the population [1]. The underlying mechanism can be explained by reduction in parathyroid calcium release and intracellular calcium concentration, in woman taking calcium supplementation during pregnancy, thereby reducing smooth muscle contractility and promoting vasodilatation and hence, decreasing the risk and or severity of HDP. Calcium also increases magnesium levels causing indirect effect on smooth muscle function. Furthermore, studies have shown a strong association between HDP and decreased calcium excretion in urine; lower urinary calcium to creatinine ratio, hypocalcaemia, decreased plasma and higher intra-membranous calcium and lower dietary intake of milk. Also pregnant women with severe HDP have significantly lower dietary calcium intake as compared to normotensive women.[2]
Calcium is the most abundant mineral in the body and is essential for many diverse processes, including bone formation, muscle contraction, and enzyme and hormone functioning. A dietary intake of 1200 mg/day of calcium for pregnant women is recommended by WHO and the Food and Agriculture Organization of the United Nations (FAO), whereas in pregnant women with low dietary calcium intake the recommended calcium is 1.5 g to 2 g daily. [3] Inadequate consumption of this nutrient by antenatal women can lead to adverse effects in both mother and fetus, including muscle Cramping, osteopenia, tremors, paraesthesia, tetanus, intra-uterine fetal growth retardation, low birth weight, preterm delivery and poor fetal mineralization.

Materials and Methods

The study was done on 60 cases of antenatal patients in the third trimester (28-40 weeks of gestation) having age between 18-40 years

All selected cases will be divided into two groups

- Cases (30 patients of hypertensive disorder in pregnancy)
- Control (30 normotensive patients)

Inclusion criteria

All antenatal patients in the third trimester (28-40 weeks of gestation) having age between 18-40 years

Exclusion Criteria

Medical complicating pregnancy such as Diabetes Mellitus, Renal failure, Chronic hypertension, Heart failure, Multiple pregnancies and Pregnancy ≤ 24 weeks of gestation. Patients on calcium lactate therapy were excluded from study.

Methodology

Serum calcium level was estimated and correlated with mild and sever hypertensive disorder in pregnancy
Statistical analysis
All the data were analyzed using Epi-info software. Analysis were performed using chi-square test and independent sample

student t test. P values <0.05 were considered to be significant.

Observations

Table 1: Comparison of general characteristic between the preeclamptic women and normal pregnant women

Contents	Cases		Controls		p-value
	Mean	S.D	Mean	S.D	
Age	23.03	3.44	22.92	3.12	>0.05
BMI	28.12	4.70	22.01	3.16	<0.05
Gravid	1.43	0.50	1.42	0.62	>0.05
Parity	0.49	0.50	0.51	0.50	>0.05
Hemoglobin	10.16	1.42	10.29	1.06	>0.05
Serum Calcium (mg/dl)	8.12	0.43	9.12	0.51	<0.05

Both groups were comparable. Significant decrease in the level of serum calcium in the preeclamptic women (8.12±0.43 mg/dl) when compared with the normal pregnant women (9.12±0.51 mg/dl).

Discussion

Hypertensive disorders of pregnancy are associated with increased morbidity and mortality, especially during delivery. Our study was conducted to assess the levels of serum Ca^{2+} in pregnant women with PIH compared to that in normal pregnancy. It also identified factors that may contribute to an increased risk of PIH. To date, no such study has been conducted in our area.

Both groups were comparable. Significant decrease in the level of serum calcium in the preeclamptic women (8.12±0.43 mg/dl) when compared with the normal pregnant women (9.12±0.51 mg/dl).

The data supported that the lowered calcium levels might be a cause in the development of preeclampsia. The effect of the serum calcium on the changes in the blood pressure could be explained by the level of intracellular concentration of calcium.

The increase in the intracellular calcium concentration when the serum calcium level went lower lead to constriction of the smooth muscles in blood vessels and an increase in vascular resistance.

Abdelmarouf H. Mohielden *et al*, 2007 [4] showed in their studies that the mean calcium concentration in the preeclampsia group is significantly lower than the normal pregnant women.

Several studies had examined the effects of the calcium supplementation on blood pressure during pregnancy thus investigating the role of calcium supplementation and its effects on blood pressure. In 1996, Bucher HC *et al* [5] conducted a meta- analysis of randomized controlled trials on the effect of calcium supplementation on preeclampsia. They concluded that the supplementation during pregnancy leads to a reduction in both systolic and diastolic blood pressure and preeclampsia.

This study result was similar to the result of various other studies like Nasser O Malas *et al*., [6] Kanchanpan Sukonpan *et al*., [7] Chanvitya Punthumapol MD *et al*., [8] Idogun ES *et al*., [8] Jain S *et al*. [10] The present study result was contradictory to some studies that the mean serum calcium levels in preeclampsia were not different from normal pregnancy like A Amirabi *et al*., [11] Villanueva S *et al*., [12] Magri *et al*. [13] A tendency to relative maternal hypocalcaemia during pregnancy has been recognised for more than 40 years. Total calcium tends to decrease over the course of pregnancy in normal women and decreased significantly during pregnancy in women who developed preeclampsia. The decrease in serum calcium levels principally involves the protein bound portion and haemodilution. Belzian and associates 1983 noted decreased calcium levels in preeclampsia and achieved decrease in blood pressure with calcium supplementation [14, 15].

Conclusion

Therefore the calcium consumption should be encouraged during the second and third trimesters of pregnancy. The dietary supplements of calcium in the form of milk, cheese, soya bean products, leafy vegetables etc., during pregnancy could result in the reduction of incidence of preeclampsia. The direct supplementation therapy of these elements can be considered for the women with preeclampsia to ensure the child survival and the safe motherhood.

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