

Serum Calcium Level in Mild and Severe Preeclampsia- A study in Combined Military Hospital, Dhaka

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Abstract

Background : Hypertensive disorders are the most common medical complications during pregnancy and are associated with high maternal and fetal mortality and morbidity. Half of the pregnant women with hypertension have preeclampsia. Association of low serum calcium level with preeclampsia (PE) is known decades together.

Objectives : To assess serum calcium level in mild and severe preeclampsia (PE).

Materials and Method : This was a comparative cross sectional study conducted in the department of Obstetric and Gynaecology, Combined Military Hospital (CMH), Dhaka, Bangladesh. The data were collected from 50 mild preeclampsia and 50 severe preeclampsia patients admitted in Obstetric and Gynaecology ward of CMH who fulfill the inclusion criteria. Study period was July 2015 to December 2015. Serum calcium was measured in Auto analyzer machine in the clinical pathology of Armed force Institute of pathology (AFIP). Data were analyzed by statistical software, SPSS version 20.

Results : Serum calcium level was found in severe PE was 8.12mg/dl and in mild PE was 8.85mg/dl. Study also reveals that routine calcium supplementation was consumed less in severe PE than mild PE patients.

Conclusion : Serum calcium is markedly reduce in severe preeclampsia than in mild preeclampsia. Therefore routine examination of serum calcium level may be useful as diagnostic marker in high risk pregnancy.

Key words : Preeclampsia, serum calcium, pregnancy, blood pressure

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Introduction

Hypertension in pregnancy is the second most common cause for maternal mortality. It is estimated that up to 30% perinatal death are due to hypertensive disorders of pregnancy.¹ Half of the pregnant women with hypertension have preeclampsia. In Bangladesh, about 16% maternal death are caused by preeclampsia and eclampsia.² Their incidence is 4-8% of all pregnancies.³ Seven hundred and ninety maternal death per 100000 live births have been reported due to pre eclampsia.⁴ Its incidence in primigravida is about 10% and in multigravida is about 5%.⁵

The exact etiology of preeclampsia is still unknown. The low level of serum calcium and high level of intracellular calcium can cause an elevation of blood pressure in pre eclamptic mother. A number of dietary deficiency or excesses have been blamed as the cause of

preeclampsia over the countries. Some studies conclude malnutrition as a risk factor in the etiology of preeclampsia because of its higher incidence in developing countries and implicate it by deficit in the intake of calcium, magnesium and zinc.⁶⁻⁸ Pregnant women who develop severe preeclampsia have significant lower dietary calcium intake when compare to normotensive women.⁹ Calcium supplement has been hypothesized to reduce chances of pregnancy induce hypertension and preeclampsia.^{10,11} The aim of the present study to estimate serum calcium level in mild and severe preeclampsia and the outcome of pregnancy.

Material and Methods

This is a cross sectional prospective study conducted in the department of Obstetric and Gynaecology in Combined Military Hospital (CMH), Dhaka between July to December

2015. One hundred pregnant women were enrolled in this study, all of them were more than 28wks of pregnancy. Fifty of them with mild preeclampsia and 50 of them with severe preeclampsia. Mild preeclampsia is defined as a blood pressure of at least 140/90mm of Hg on two occasions at six hours apart associated with proteinuria. Severe preeclampsia defined as one or more criteria of the followings: blood pressure of at 160/110 mm of Hg at least on two occasions at 6 hours apart with proteinuria, with oliguria (<500ml/24hours) or cerebral/visual disturbances or pulmonary oedema or any other features of end organ damage. Sampling technique was purposely consecutive sampling. All relevant data including medical and obstetric history, family history and other risk factors for preeclampsia were recorded in a pretested questionnaire. After counseling the couple and taking written consent, five ml of venous blood was collected from the study patient (from her ante-cubital vein under aseptic precaution) for biochemical test. Serum calcium was measured in Auto analyzer machine in the Department of clinical pathology of Armed forced Institute of pathology (AFIP). They were followed up regularly upto delivery. Results were analyzed by statistical software, SPSS version 20.

Results and observation

The study enrolled 100 pregnant women with mild and severe PE. Among them in case of mild preeclampsia 76% were below 25 years of age and 24% were above 25 years. About 72% of severe PE cases were below 25 years of age and 28% were above 25 years (Fig.-1)

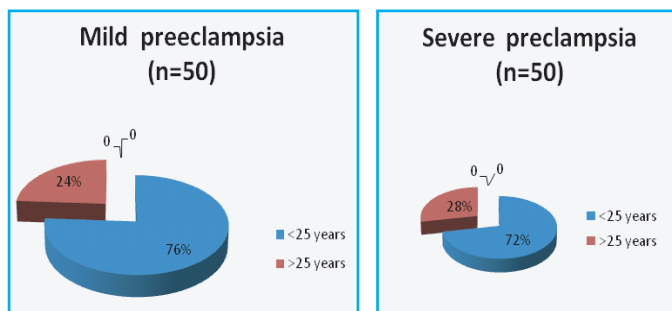


Fig.- 1 : Age and percentage of the cases (n=100).

In this study serum calcium level was low (8-9mg/dl) in 76% in mild PE cases and 88% in severe PE cases while very low (7-8mg/dl) in 10% of severe PE cases only (table-1).

Table I : Serum calcium level in mild (n=50) & severe PE (n=50)

| Serum Calcium | Mild PE | % | Severe PE | % |
|---------------------|---------|-----|-----------|-----|
| Normal (9-11mg/dl) | 12 | 24% | 01 | 02% |
| Low (8-9mg/dl) | 38 | 76% | 44 | 88% |
| Very low (7-8mg/dl) | 0 | 0 | 05 | 10% |

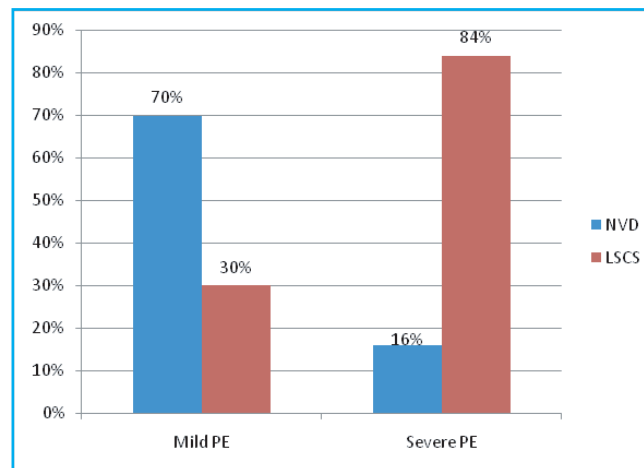
In our study we found that, mild and severe preeclampsia were more common in primigravida (78%) and (76%) patients respectively (table-II).

Table II : Number of parity with severity of PE (n=100)

| Gravida | Mild PE(n=50) | % | Severe PE (n=50) | % |
|--------------|---------------|-----|------------------|-----|
| Primigravida | 39 | 78% | 38 | 76% |
| Multigravida | 11 | 22% | 12 | 24% |

This study results showed that lower segment caesarean section(LSCS) is more common in severe PE(84%) than in mild PE(30%) but NVD is higher(70%) in mild PE(Fig-2).

Fig.-2: Mode of delivery with severity of PE(n=100).



In this study, the birth weight of baby was low in severe PE(66%) than in mild PE(22%). In severe PE 12% of baby's birth weight was less than 2kg but no one was with this weight in mild PE (table-III).

Table III : Birth weight with severity of PE(n=100).

| Birth weight | Mild PE(n=50) | % | Severe PE(n=50) | % |
|--------------|---------------|-----|-----------------|-----|
| <2kg | 0 | 0% | 06 | 12% |
| 2-2.5kg | 11 | 22% | 33 | 66% |
| 2.5-3kg | 25 | 50% | 11 | 22% |
| >3kg | 14 | 28% | 0 | 0% |

Our study reveals that routine calcium supplementation is less in severe PE(22%) than mild PE(84%). Only 11 cases of severe PE had taken regular calcium supplementation after 3months of gestation and 34 cases started calcium after 5 months whereas 5 cases did not take any calcium supplementation throughout the pregnancy (table-IV).

Table IV: Calcium supplementation in mild and severe PE(n=100).

| Calcium supplementation started | Mild PE (n=50) | % | Severe PE (n=50) | % |
|---------------------------------|----------------|-----|------------------|-----|
| At 3months of gestation | 42 | 84% | 11 | 22% |
| At 5months of gestation | 6 | 12% | 34 | 68% |
| Never intake during gestation | 2 | 4% | 5 | 10% |

Drinking of milk in severe PE cases were less, only 21 cases had taken one glass (250ml) of milk regularly while 9 cases never took milk throughout their pregnancy (table-V).

Table V : Drinking milk with severity of PE cases (n=100).

| Drinking milk (250ml) | Mild PE(n=50) | Severe PE(n=50) |
|-----------------------|----------------|-----------------|
| Daily | 31 | 21 |
| Occasionally | 16 | 20 |
| Never | 3 | 9 |

Discussion

Preeclampsia occurs in about 4% to 8% of all pregnancy.³ Usually, there are three primary characteristics of this condition, pregnancy induced hypertension, protein in the urine and oedema.¹² Our study shows that the age has direct and constant relationship with preeclampsia. Seventy four percent patients were below 25 years of age (Fig.-1) which are almost similar to previous study by Aruna Patel¹³ who found 78% of patients with preeclampsia are below 25 years.

This study observed significantly lower calcium level in severe PE is 8.12mg% and in mild PE was 8.85mg%. Only 13% patients had normal serum calcium level, 72% patients had low level and 5% patients had very low serum calcium level (table-I). Similar observations were reported by other investigators of different countries.¹⁴⁻¹⁶ The data supported the hypothesis that calcium might be a cause of development of pre eclampsia.¹⁷

The increase of intracellular calcium concentration when serum calcium went lower leads to constriction of smooth muscle in blood vessels and increase vascular resistant which ultimately led to raise blood pressure.^{18, 19} This study shows patients with regular calcium supplementations and daily intake of milk or milk products had normal or mildly raised serum calcium level than who never/irregularly intake calcium supplementations and occasionally intake milk or milk products. Previous study also showed lower intake of calcium in preeclamptic patients.²⁰ Belijan and et al. noted decreased calcium levels in preeclampsia and achieved decrease in blood pressure with calcium supplementations.^{21,22}

Caesarean section is more common in severe PE than mild PE (84% vs 30%, Fig.-2). Birth weight of baby of severe PE patients is significantly lower than mild PE patients. Six percent were very low birth weight, 12% low birth weight & 22% were at normal weight in severe PE while 22% were low birth weight & 78% are normal birth weight in mild PE (table-III). It is possible that the blood pressure lowering effect of calcium supplementation could be even greater in women with mild PE. In support of our observations, Knight and Keith in a randomized control trial involving both normotensive and hypertensive pregnant women reported that calcium supplementation (1000mg/day) significantly lowered the diastolic blood pressure in hypertensive groups only.²³ Therefore this study advocates

the value of serum calcium as a marker of preeclampsia which also suggested by JM Belijana decade ago.²⁴

Conclusion

This study suggests that the low level of maternal serum calcium may have a role in the development of preeclampsia. Serum calcium level is more lower in severe preeclampsia than mild preeclampsia. Routine estimation of serum calcium level during antenatal period and proper supplementation of calcium may reduce the incidence of preeclampsia.

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