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Serum Calcium, Serum Magnesium and Serum Iron in Preeclampsia

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Introduction:

Preeclampsia is a pregnancy specific syndrome and a leading cause of maternal and foetal morbidity and mortality. Preeclampsia is a multisystem disorder characterized by hypertension to the extent of 140/90 mm of Hg or more, proteinuria (\geq 300 mg/day) and edema induced by pregnancy after 20th week.¹ However preeclampsia is a complex multisystem syndrome and far more than gestational hypertension and proteinuria.² Preeclamptic women shows decrease in serum calcium level. An increase in intracellular calcium in vascular smooth muscle cells during pregnancy is consistent with development of vasoconstriction and resultant hypertension.^{3,4} The biochemical mechanism is presently unclear for this phenomenon.⁴

Hypomagnesemia in preeclmptic women is associated with haemodilution, renal clearance and increased mineral consumption by growing fetus.^{5,6} Magnesium levels may have significant effects on

Abstract:

Aim: To understand the alteration in biochemical parameters in preeclamptic women. Material and method: Study consists of 120 subjects with age > 18 yrs Group I: 40 non hypertensive pregnant women. Group II: Includes 80 preeclamptic women. Venous blood samples were collected during ante partum period and serum levels of Calcium, Magnesium and Iron were measured. Result: Serum calcium level is significantly decreased (p< 0.001) in in group II (6.73 ± 1.11) as compared to group I (9.93 ± 0.73), Serum Magnesium level is significantly decreased (p< 0.001) in in group II (6.73 ± 0.001) in in group II (1.92 ± 0.32), Serum Iron level is significantly increased (p< 0.001) in in group II (47.12 ± 9.123) as compared to group I (24.22 ± 5.95). Conclusion: Estimation of these parameters will help clinician for early diagnosis and treatment which will prevent further life threatening complications and mortality.

Key words: Preeclampsia, Serum Calcium, Serum Magnesium, Serum Iron.

cardiac excitability, vascular tone and contractility.^{7,8,9}

Higher serum iron level in preeclamptic women is because of haemolysis, hepatocellular injury and haemoconcentration. It is observed that the haemolytic reaction is responsible for increase in serum iron seen in preeclamptic women.¹⁰ In view of the above, the present study involves assessment of serum calcium, serum magnesium and serum iron levels in preeclampsia.

Materials and Methods:

Institutional ethical committee approved this study and verbal informed consent was also taken from the patients. Considering the prevalence of preeclampsia as 20% in Indian population with allowable error of +/- 6 % at p < 0.05 the estimated sample size is 120.

Group I: 40 non hypertensive pregnant women.

Group II: Includes 80 preeclamptic women. The preeclampsia patients diagnosed by presence of persistent hypertension more than 140/90 mm Hg.

Women having addictions like smoking, alcoholism, Women having h/o multiple foetuses, chronic hypertension, renal diseases, diabetes mellitus and other pre-existing medical conditions were excluded from the study. Venous blood sample about 5 cc were collected in plain bulb with informed consent from each subject in antenatal period and was processed within 72 hrs at central clinical laboratory of Tertiary Care Institute.

Following parameters were estimated.

- 1) Serum Calcium-O-Cresolpthalin Complexone (O-CPC).^{11,12}
- 2) Serum Magnesium- Calmagite method.¹³⁻¹⁵
- 3) Serum Iron- Ferrozine Method.¹⁶⁻¹⁸

Statistical analysis was done using the unpaired T-test.

Sr. No.	Study Groups	Serum calcium mg/dl Mean ± SD	Serum Magnesium mg/dl Mean ± SD	Serum Iron Mmol/L Mean ± SD
1	Group I	9.93 ± 0.73	1.92 ± 0.32	24.22 ± 5.95
2	Group II	6.73 ± 1.11***	0.81 ± 0.19***	47.12 ± 9.123***

*** p < 0.001 - Highly Significant when group-I is compared with group-II

Discussion:

Pregnancy is a physiological stress unique to pregnancy. Hypertension in pregnancy increases maternal and fetal mortality and morbidity. This study shows the alteration in selected parameters in preeclamptic women. Due to cellular injury and cellular death in preeclampsia, there is influx of calcium ions into cell leading to increased intracellular calcium ions and loss of calcium homeostasis. When serum calcium is lowered there is increased intracellular calcium concentration which leads to constriction of smooth muscles in blood vessels and increased vascular resistance.¹⁹ Pregnancy is a state of magnesium depletion. The total and ionized magnesium levels are significantly lower in normal pregnancy compared to nonpregnant women.^{20,21} The levels tend to fall during pregnancy and further decrease in women who develop preeclampsia later.²¹ It is also mentioned in previous studies that the concentration of magnesium during pregnancy exceeds the intake creating state of physiological а hypomagnesaemia.²² The hemodilution in last pregnancy could be trimester of another contributing factor for hypomagnesaemia.^{23,24}

It is suggested that haemolysis, liver damage (causing release of iron) and decrease in erythopoesis may be a major contributory factor for the increased levels of serum iron in preeclampsia.²⁵

Conclusion:

Preeclmpsia is one of the complications of pregnancy. When convulsions occur in preeclamptic women it leads to eclampsia and finally if left untreated death can occur. In spite of increasing knowledge and advancement in treatment modalities in medical field hypertension in pregnancy is the cause to worry for gynecologists. To conclude serum levels of Calcium, Magnesium and Iron will help to the clinicians for early diagnosis, appropriate treatment and also prevents occurrence of complications.

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