



**ORIGINAL RESEARCH PAPER**

**Gynaecology**

**COMPARISON OF SERUM CALCIUM LEVELS BETWEEN PREECLAMPTIC AND NORMOTENSIVE PREGNANT WOMEN**

**KEY WORDS:** Preeclampsia, Calcium, Women.

<b>Dr. Jyoti Parmar*</b>	Resident doctor, Department of Obstetric & Gynaecology, J.L.N Medical college and Associated Group of Hospitals, Ajmer (Rajasthan). *Corresponding Author
<b>Dr. Sandhaya Choudhary</b>	Associate Professor, Department Of Obstetrics And Gynaecology, JLN Medical College, Ajmer (Raj.).
<b>Dr. Himanshi Gangwal</b>	Assistant Professor ,Department Of Obstetrics And Gynaecology, JLN Medical College, Ajmer (Raj.).

<b>ABSTRACT</b>	<b>Background-</b> The purpose of this study is to compare mean serum calcium levels of pre-eclamptic and normotensive pregnant women.
	<b>Methods-</b> The prospective study will be conducted at RMC, JLN medical college, Ajmer and hospital during May 2019 to April 2020 after a written informed consent from all the patients and Ethical Committee approval was obtained before starting the study.
	<b>Results-</b> Significant decrease in the level of serum calcium in the preeclamptic women (8.14±0.40mg/dl) when compared with the normal pregnant women(9.03±0.57mg/dl).
	<b>Conclusion-</b> These findings support the hypothesis that hypocalcaemia are possible etiologies of preeclampsia.

**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.<sup>1</sup> 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 intramembranous calcium and lower dietary intake of milk. Also pregnant women with severe HDP have significantly lower dietary calcium intake as compared to normotensive women.<sup>2</sup>

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.<sup>3</sup> 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, intrauterine fetal growth retardation, low birth weight, preterm delivery and poor fetal mineralization.

The purpose of this study is to compare mean serum calcium levels of pre-eclamptic and normotensive pregnant women. This would help us to formulate strategies to counsel high-risk women in antenatal period for the importance of increase intake of food rich in calcium, e.g. milk and milk products and calcium supplementation. Such simple prophylactic measures may reduce the maternal and fetal morbidity and mortality associated with this serious obstetric complication.

**MATERIALS AND METHODS**

**Study area**

The prospective study will be conducted at RMC, JLN medical college, Ajmer and hospital during May 2019 to April 2020 after a written informed consent from all the patients and Ethical Committee approval will be obtained before starting the study.

**Sample size**

The study will be done on 100 cases of antenatal patients in the third trimester (28-40 weeks of gestation) having age between 18-40 years who will attend JLN Medical College and Hospital, Department of Obstetrics and Gynaecology in a time duration of one year from May 2019 to April 2020.

**All selected cases will be divided into two groups:**

- Cases (50 patients of hypertensive disorder in pregnancy)
- Control (50 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**

Pregnancy induced hypertensive disorder in pregnancy was classified as mild when systolic blood pressure is >140 mmHg, diastolic blood pressure is >90 mmHg and urinary albumin traces or +1) and severe as systolic blood pressure >160 mmHg, diastolic blood pressure >110 mmHg and urinary albumin +2. Above alteration in blood pressure will be observed at least on two different occasions at least 6 hours apart. A detailed history along with detailed general physical examination of patients and obstetric examination was also performed.

Serum calcium level was estimated and correlated with mild and severe hypertensive disorder in pregnancy

**Statistical analysis:** All the data were analyzed using IBM SPSS- ver.20 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	23.82	3.44	23.80	3.08	>0.05
BMI	28.71	4.70	22.21	3.18	<0.05
Gravid	1.48	0.50	1.40	0.63	>0.05
Parity	0.52	0.50	0.51	0.50	>0.05
Pulse	96.76	8.05	94.08	8.21	>0.05
Systolic Blood Pressure (mmHg)	156.96	14.11	101.36	9.19	<0.05
Diastolic Blood pressure (mmHg)	100.24	6.81	68.56	5.95	<0.05
Hemoglobin	10.29	1.42	10.29	1.06	>0.05
Serum Calcium (mg/dl)	8.14	0.40	9.03	0.57	<0.05

Age of preeclamptic women (23.82±3.44 Yrs) is slightly higher than that of the normal pregnant women (23.80±3.08 Yrs). BMI of preeclamptic women (28.71±4.70 kg/mt<sup>2</sup>) is significantly higher than that of the normal pregnant women (22.21±3.18 kg/mt<sup>2</sup>). Insignificant difference in the pulse rate between the cases (96.76±8.05 per minute) and the controls (94.08±8.21 per minute). Significant increase in systolic pressure in the preeclamptic women (156.96±14.11 mm Hg) compared to the normal pregnant women (101.36±9.19 mm Hg). Significant increase in diastolic pressure in the preeclamptic women (100.24±6.81 mm Hg) compared to the normal pregnant women (68.56±5.95 mm Hg). Significant difference in the urine albumin levels between the cases and the controls. Insignificant difference in the hemoglobin levels between the cases and the controls. Significant decrease in the level of serum calcium in the preeclamptic women (8.14±0.40mg/dl) when compared with the normal pregnant women (9.03±0.57mg/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<sup>2+</sup> 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 Ajmer.

The normal serum calcium concentration is 8.5 – 10.5 mg/dl. From the above results it is evident that there is a significant decrease in the level of serum calcium in the preeclamptic women (8.14±0.40mg/dl) when compared with the normal pregnant women (9.03±0.57mg/dl) in our study.

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<sup>4</sup>** 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<sup>5</sup>**

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.,<sup>6</sup> Kanchanpan Sukonpan et al.,<sup>7</sup> Chanvitya Punthumapol MD et al.,<sup>8</sup> Idogun ES et al.,<sup>9</sup> Jain S et al.<sup>10</sup> 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.,<sup>11</sup> Villanueva S et al.,<sup>12</sup> Magri et al.<sup>13</sup> 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.<sup>14,15</sup>

**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.

**REFERENCES**

- Ozkan H, Cetinkaya M, Koksall N, Ozmen A, Yildiz M. Maternal preeclampsia is associated with an increased risk of retinopathy of prematurity. *Journal of Perinatal Medicine*. 2011;39(5):523-7.
- Imdad A, Jabeen A, Bhutta ZA. Role of calcium supplementation during pregnancy in reducing risk of developing gestational hypertensive disorders: a metaanalysis of studies from developing countries. *BMC Public Health*. 2011;11(Suppl 3):S18. doi:10.1186/1471-2458-11-S3-S18.
- Hofmeyr CJ, Atallah AN, Duley L. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. *Cochrane Database Syst Rev*. 2006 Jul 19; (3):CD001059. Review. Update in: *Cochrane Database Syst Rev*. 2010; (8):CD001059. PubMed PMID: 16855957.
- Abdelmarouf H. Mohielden, Asma A. Dokem, Yousif H M, Osman, Hamza M. A Idris. Serum calcium level as a marker of pregnancy induced hypertension. *Sudan JMS*, Dec 2007; 2(4): 245-48.
- Bucher H.C, Guyatt G.H., Cook R.J. Effects of calcium supplementation on pregnancy induced hypertension and preeclampsia. A meta-analysis of randomized controlled trials. *JAMA*, 1996; 275: 1113-7.
- Naser O. Malas. Does serum calcium in preeclampsia and normal pregnancy differ? *Saudi Med J*. 2001;22(10):868-71.
- Kanchanpan Sukonpan, Vorapong Phupong. Serum calcium and serum magnesium in normal and preeclamptic pregnancy. *Arch Gynaecol Obstet*. 2005;273(1):12-6.
- Chanvitya Punthumapol, Boonsri Kittichotpanich. Serum calcium, magnesium and uric acid in preeclampsia and normal pregnancy. *J Med Assoc Thai*. 2008;91(7):968-73.
- Idogun ES, Imarengiaye CO, Momoh SM. Extracellular calcium and magnesium in preeclampsia and eclampsia. *Afr J Reprod Health*. 2007 Aug;11(2):80-5.
- Jain S, Priyamvada Sharma, Shobha K, Govind Mohan, Saroj Singh. The role of calcium and magnesium and zinc in preeclampsia. *Biol Trace Elem Res*. 2010 Feb;133(2):162-70.
- Amirabi A, Golmohammadlou S, Yazdian M, Pashapour N. Evaluation of serum calcium, magnesium, copper, zinc levels in women with preeclampsia. *Iran J Med Sci*. 2008;33(4):231-4.
- Villanueva LA, Figueroa A, Villanueva S. Blood concentration of calcium and magnesium in women with severe preeclampsia. *Gynaecol Obstet Mex*. 2001 Jul;67:277-81.
- Magri J, Sammut M, Savon C. Lead and other metals in gestational hypertension. *Int J Gynaecol Obstet*. 2003;83:29-36.
- Belijan JM, Villar J, Repke J. The relationship between calcium intake and pregnancy induced hypertension, upto date evidence. *Am J Obstet Gynaecol*. 1988;158:898-902.
- Belijan JM, Villar J, Zalazar A, Rojas L, Chan D, Bryce GF. Preliminary evidence of effect of calcium supplementation on blood pressure in normal pregnant women. *Am J Obstet Gynaecol*. 1983a;146:175-80.