Original Research Paper

Volume - 12 | Issue - 05 | May - 2022 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Obstetrics & Gynaecology

CORRELATION OF SERUM CALCIUM LEVELS IN NORMAL PREGNANCY, PRE-ECLAMPSIA AND ECLAMPSIA

Dr Uravashi Barman Singh — Profersor, Department of Obs And Gynae, Mln Medical College, Prayagraj.

Dr Anita Lakhraj* — Junior Resident, Department Of Obs And Gynae, Mln Medical College, Prayagraj. *Corresponding Author

Dr Shakti Jain — Assitant Proffessor, Department of obs and gynae, MLN Medical College, Prayagraj.

ABSTRACT **INTRODUCTION:** Pre-eclampsia (PE) is a disorder of pregnancy characterised by hypertension with proteinuria after 20 weeks of pregnancy in previously normotensive and non-proteinuric .The etiopathology of pre-eclampsia is not known even after significant research done on it. A strong strategy in its management is to try to reduce the incidence and severity by predicting its occurrence.

AIM: To study correlation of serum calcium level in normal pregnancy ,pre-eclampsia and eclampsia

Methods: Total 150 pregnant patients attending Swaroop Rani Nehru Hospital Prayagraj were included in the study. They were divided into two groups namely normotensive and hypertensive of 75 each. The serum calcium level was estimated and the correlation of these levels was studied with the pre-eclampsia related factors. The data was analysed by application of statistical test of significance.

Result: Mean serum calcium level in the normotensive group was 10.11±2.48 mg/dl while mean serum calcium level in the hypertensive group was 8.72±2.15. **Conclusions:** This study shows that low level of calcium is found in serum of pre-eclampsia patients as compared to normotensive cases of the study population. The severity of pre-eclampsia is inversely proportional to the levels of serum calcium .

KEYWORDS : Hypertensive disorder in pregnancy, Pre-eclampsia, Serum calcium.

INTRODUCTION

Preeclampsia is one of the commonest etiologies of fetal and maternal mortality and morbidity. (1) The incidence of preeclampsia in developing nations is estimated to be 4–18%.(2). Pregnancy may induce hypertension in women who are apparently normotensive before pregnancy(3). Hypertensive disorders in pregnancy complicate 4 to 10% of pregnancies worldwide(4). It accounts for about 15 percent of all death globally, almost all of which occur in developing countries [4] Hypertensive disorders in pregnancy include spectrum of diseases ranging from mild elevated blood pressure to multiple organ dysfunction.(5)

During pregnancy inadequate nutrition might be harmful not only to mother but also to the growing fetus (6). Pathophysiology of preeclampsia likely involves maternal and fetal physiological perturbations. The pathophysiological mechanism is characterized with the failure of the trophoblastic invasion in the spiral arteries, leading to maladaptation of spiral arterioles, which may be associated with an increase vascular resistance of the uterine artery and a decrease perfusion of the placenta.The implicated vascular resistance and under perfusion of the placenta, may lead trelease of antiangiogenic factors into the maternal circulation and alter maternal systemic endothelial function to cause hypertension and other manifestation of the disease.(7) Other contributory factors include obesity, diabetes, calcium deficiency, maternal age and job stress.(8).There is an increasing evidence of the recommended daily allowances of dietary calcium intake in Indian population.(9) Serum calcium level in human body is not only regulated by dietary calcium intake but it is also influenced by many other factors like level of parathyroid hormones, vitamin D, exposure to sunlight.(10) Calcium requirement in non-pregnant state is 600 mg/day which increases to 12,00 mg/day during pregnancy (11).This increase amount of calcium is required for the growth and development of bones, teeth of fetus. This Demand can be met by the increase intake of calcium during pregnancy (12) Serum calcium level decreases during second and third trimesters of pregnancy, primary due to hemodilution.(13) On physiological basis, calcium plays an important role in muscle contraction and regulation of water balance in cells. Modification of plasma calcium concentration leads to alteration of blood pressure. The lowering of serum calcium and the increase of intracellular calcium can cause an elevation of blood pressure in pre-eclamptic women (14). Decreases in serum calcium level stimulate the release of rennin and parathyroid hormones. These hormones increases intracellular concentration of calcium in vascular smooth muscle cells. This leads to vasoconstriction and increased peripheral vascular resistance, culminating in raised blood pressure.(15) Thus, abnormalities in calcium homeostasis may contribute to the abnormal vasculopathy that has been already manifested in pre-eclampsia.(16)

Material and Methodology

The study was conducted in department of obstetrics and gynaecology, Swaroop Rani Nehru hospital, Department of Obstetrics and Gynaecology, Moti Lal Nehru Medical College, Prayagraj. The study population comprised of pregnant women attending the OPD and IPD during AUGUST 2020 to JULY 2021. This study was a observational study. This study include 75 normotensive pregnant women and 75 hypertensive pregnant women. Approval was obtained from ethical committee prior to commencement of the study.

INCLUSION CRITERIA

1. All pregnant women visiting Swaroop Rani Nehru Hospital of more than 20 week period of gestation
2. Known case of gestational hypertension, preeclampsia and eclampsia.
3. Singleton pregnancy
4. Age : 20 to 40 years
5. No history of Diabetes

EXCLUSION CRITERIA

1. All pregnant women of period of gestation less than 20 week
2. Women with gestational diabetes mellitus and pre gestational diabetes
3. Chronic hypertension
4. Women with Gastrointestinal disease or chronic malabsorption syndrome.
5. Women not giving consent.

Patients were selected for the study based on the inclusion criteria and by subjecting them to history taking, clinical examination (general physical examination, vitals, systemic examination, obstetric examination). Written informed consent was obtained from each woman before inclusion in the study. A detailed clinical history was taken regarding age, gravid , parity, occupation, socioeconomic status, dietary history, marital status, smoking status, and previous history of any hypertensive disorder in pregnancy. Menstrual history regarding first day of last menstrual period, expected date of delivery and present and previous menstrual cycle was taken . Clinical examination including weight, height, body mass index, pallor, icterus, edema, thyroid examination, pulse, blood pressure and breast examination. Systemic examination of central nervous system, cardiovascular and respiratory system was done. Obstetric examination includes fundal height, external ballotment in early pregnancy, lie, presenting part and fetal heart sound in advance pregnancy. All the study population was followed till delivery. Serum Calcium was measured by Direct colorimetric complexometric test (Arsenazo III) end point.

STATISTICALANALYSIS

A p-value <0.05 was considered statistically significant. The data was analysed using SPSS statistical software (version 20.0).

RESULT

A total 150 pregnant women of gestational age ranging from 20 to 40 weeks of gestation were recruited for the study. Out of them, 75 women were normotensive who comprised the control group. 75 women were hypertensive , comprising the study group. The study group was further divided on the basis of blood pressure, proteinuria and convulsion. Serum calcium were analysed for all the women. All the women were followed up till delivery.

The mean age of control group was 24.80±4.45 years whereas mean age of study group was 24.65±4.47 years.p-value was 0.841 which is statistically insignificant. The majority of the pre-eclamptic women were primigravida (65.33%). Out of the total 75 pre-eclamptic women, 43 (57.33%) had mild pre-eclampsia while 19 (25.33%) had severe pre-eclampsia and 13 (17.33%) developed eclampsia. In the pre-eclamptic group, 9 (12%) patients had no proteinuria, 30 (40%) of pre-eclamptic women had urine albumin +1, 23 (30.67%) had urine albumin +2 while 13 (17.33%) had urine albumin ≥+3. Majority (62.67%) of the patients developed pre-eclampsia at 32-34 weeks of gestation. 21 (28.00%) of women who had pre-eclampsia required no treatment and were managed on close observation. 24 (32.00%) were started on antihypertensive drugs to manage their condition. 30 (40%) had to be given magnesium sulphate along with antihypertensive drugs, either for prophylactic or therapeutic purposes.

Table No 1the Demographic Characteristics And Mean Blood Arterial Pressure Is Depicted

GENERAL CHARACTERISTIC	STUDY GROUP (N=75)	CONTROL GROUP (N=75)	P-VALUE
AGE (Years)	24.65+/-4.47	24.80+/-4.45	0.841
BMI (kg/m2)	27.54+/-4.64	25.73+/-5.40	0.029
SBP (mmhg)	157.52+/-8.64	117.64+/-8.64	0.001
DBP (mmhg)	100.72+/-9.48	74.51+/-6.20	0.001
MAP (mmhg)	119.65+/-8.44	88.88+/-14.60	0.001

Table No 2 : Comparisons Of Mean S.ca2+ In Between Control And Study Group

Parameter	Control Group (n=75)		Study Group (n=75)		T	p-Value
	Mean	±SD	Mean	±SD		
S.Ca2+	10.11	2.48	8.72	2.15	-3.93	<0.001*

*=Significant (p<0.05)

Table No 3:relationship Between Serum Calcium And Case

Parameter	Normotensie (n=75)	Mild Preeclampsia (n=43)	Severe Preeclampsia (n=19)	Eclampsia (n=13)	P-VALUE
S.Ca (mg/dl)	10.11±2.48	8.74±1.07	8.70±0.96	8.66±0.84	<0.001*

*=Significant (p<0.05)

Table No 4 : Correlation Of Systolic And Diastolic Blood Pressure With Serum Calcium Levels

N =150	Pearson Correlation	P-value
Systolic BP with S. calcium	-0.611**	<0.001
Diastolic BP with S. calcium	-0.559**	<0.001

It can be very clearly seen that serum calcium is significantly lower in pre-eclamptic women compared to normotensive women. The severity of pre-eclampsia is inversely proportional to the levels of serum calcium.The mean serum calcium level in the control group was 10.11±2.48 mg/dl while mean serum calcium level in the study group was 8.72±2.15 , leading to the conclusion that serum calcium levels are significantly lower in pre-eclampsia patients compared to normotensive pregnant women (p-value <0.001). The mean serum calcium level in mild pre-eclampsia was 8.74±1.07 mg/dl, while in severe pre-eclampsia was 8.70±0.96 mg/dl and in eclamptic patient was 8.66+/-0.84. p-value is <0.84. Hence it can be concluded that there is a significant relationship between serum calcium level and degree of pre-eclampsia. Serum calcium had a significant negative correlation with SBP (R=-0.611, p=<0.001) and with DBP (R=-0.559, p<0.001)

DISCUSSION

In the present study, it is found that mean serum calcium level in the control group was 8.72±2.48 mg/dl while mean serum calcium level in the study group was 10.11±2.48. p-value is <0.001 , which is statistically significant. So, it can be concluded from this study that serum calcium levels are significantly lower in pre-eclampsia patients compared to normotensive pregnant women. Archana bharti et al (17) conducted a study in 2018 and found that there is significant reduction in the level of serum calcium in pre-eclamptic women as compared to normotensive women (7.9 ± 0.2 mg / dl vs 10.2 ± 0.3 mg/dl) Their study supported the hypothesis that calcium deficiency might be one of the causes in the development of pre-eclampsia. Further, it was seen that, mean serum calcium level in mild pre-eclampsia was 8.74±1.07mg/dl, while in severe pre-eclampsia was 8.70±0.98 mg/dl and in eclampsia was 8.66+/-0.84. p-value is <0.001. So, it is seen that there is a significant relationship between serum calcium level and degree of pre-eclampsia. Hence it can be concluded that serum calcium level is lowest in eclamptic caseand serum calcium level was lower in severe pre-eclampsia than in mild pre-eclampsia. The findings were similar to the study of Pransi Gupta et al (2020) (18), W jarin et al (2014)(19) and Saloni Sethi et al (2021)(20) .

CONCLUSION

The present study was conducted on 150 women attending the outpatient and in patient Department of Obstetrics and Gynaecology in Motilal Nehru Medical College, Prayagraj in collaboration with the Department of pathology over a period of twelve months during the year 2020 - 2021.The study was under taken to study the " Correlation of serum calcium levels in normal pregnancy, pre-eclampsia and eclampsia ". The mean serum calcium levels in the women who developed preeclampsia (study group) was 8.72 ± 2.15 mg/dl. The mean serum calcium levels in the women who remained normotensive (control group) was 10.11 ± 2.48 mg /dl.. The mean level of serum calcium was statistically significant (p<0.001). The serum level of caclium is lowest in cases with eclampsia, followed by that of severe preeclampsia, mild preeclampsia and highest in normotensive pregnancy. The findings are statistically significant(P<0.05). This shows that the severity of preeclampsia and eclampsia is inversely proportional to the level of serum calcium Nutritional deficiency are common during pregnancy and pregnant women in developing countries like ours have been reported to consume diets that are low in minerals and vitamins. According to the results of our study early detection and supplementation, mainly calcium may help in the reduction of incidence of preeclampsia especially in a population of a developing country like ours where the nutrition is poor. Lower levels of serum calcium is related to preeclampsia, which poses a serious threat to both mother and fetus and necessitates the search for preventive strategies far at risk pregnancies. If preeclampsia is not diagnosed or treated on time it can lead to maternal and fetal complications such as coagulopathy, multiorgan failure, fetal growth restriction, intrauterine fetal death. Therefore, 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 this elements can be considered for women with preeclampsia to ensure less maternal and fetal complications.

This study recommends that a multicentric cohort study with large population is needed to support the hypothesis that lower serum calcium is associated with preeclampsia and its severity. However with regards to result of present study measurement of serum calcium can be suggested to be an indicator of preeclampsia, its severity and its complications.

REFERENCE

1. Sukonpan K, Phupong V. Serum calcium and serum magnesium in normal and preeclamptic pregnancy. Arch Gynecol Obstet. 2005;273(1):12–16.
2. Villar J, Betran A, Gulmezoglu M. Epidemiological basis for the planning of maternal health services. WHO/RHR. 2001;111:298–302
3. Conde-Agudelo A, Belizan J.M. Risk factors for preeclampsia in a large cohortof Latin American andCaribbean women. BJOG.2000;107(1):75-83.
4. Goldenberg RL, McClure EM, Macguire ER, Kamath BD, Jobe AH.Lessonsfor low-income regions following the reduction in hypertension-related maternalmortality in high-income countries. Int J Gynaecol Obstet. 2011;113(2):91–5.Epub 2011/02/26. S0020-7292(11)00046-4[pii]doi:10.1016/j.ijgo.2011.01.002pmid:21349517
5. Yücesoy G,OzkanS,BodurH,TanT,CalişkanE,VuralB,CorakçiA:Maternal and perinatal outcome in pregnancies complicated with hypertensivedisorder of pregnancy: a seven year experience of a tertiary care center. ArchGynecolObstet. 2005, 273:43-49. 10.1007/s00404-005-0741-3
6. Al-Jameil N, Aziz Khan F, Fareed Khan M, Tabassum H. A brief overview ofpreeclampsia. JClin MedRes. 2014;6(1):01-07

7. ChaurasiaPP,JadavPA,JasaniJH.Changesinserumcalciumandserummagnesium level in preeclampsia vs normal pregnancy. Int J Biomed Adv Res.2012;3:511–3.[Google Scholar]
8. SibaiBM.Preventionof preeclampsia:A bigdisappointment.Am Jobstet Gynecol.1998; 179:1275–8. [PubMed][Google Scholar]
9. Kumar A, Meena M, Gyaneshwori Devi S, Gupta RK, Batra S. Calcium inmidpregnancy.ArchGynecolObstet.2009Mar;279(3):315-9.https://doi.org/10.1007/ s 00404-008-0705-5
10. Gupta A, Kant S, Pandav CS, Gupta SK, Rai SK, Misra P. Dietary CalciumIntake, Serum Calcium Level, and their Association with Preeclampsia in RuralNorthIndia.Indian JCommunityMed. 2016 Sep;41(3):223-7
11. Dietary Guidelines for Indians - a Manual. National Institute of Nutrition, IndiaCouncilof Medical Research.NIN Press, Hyderabad 2011.
12. Dietary Guidelines for Indians - a Manual. National Institute of Nutrition, IndiaCouncilof Medical Research. NINPress, Hyderabad 201
13. PitkinRM,GebhardtMP.Serumcalciumconcentrationsinhumanpregnancy.AmJObstet Gynecol. 1977 Apr1;127(7):775
14. 14calcium level in preeclampsia compared to normal pregnancy. Int J Clin Biochem Res 2015;2(4):242-245
15. Sukonpan K, Phupong V. Sukonpan K, et al. Arch Gynecol Obstet. 2005 Nov;273(1):12-6. doi: 10.1007/s00404-004-0672-4. Epub 2005 Oct 28. Arch Gynecol Obstet. 2005. PMID: 15480721
16. Nirmala et al (2008), Evaluation of serum magnesium and calcium in the prediction of preeclampsia in at risk mothers,
17. Archana Bharti et al, Serum calcium and magnesium in preeclampsia and normal pregnancy, Serum calcium and magnesium in preeclampsia and normal pregnancy,Volume 4; Issue 4; April 2018; Page No. 187-189
18. Pranshi Gupta et al (2020), A study ofmaternal serum calcium and serum magnesium levels in preeclamptic and normotensive pregnancies. Int J Reprod Contracept Obstet Gynecol. 2020 Aug;9(8):3129-3133
19. 19Jafrin W, Mia AR, Chakraborty PK, Hoque MR, Paul UK, Shaha KR, Akhter S, Roy AS. Jafrin W, et al. Mymensingh Med J. 2014 Oct;23(4):649-53. Mymensingh Med J. 2014. PMID: 25481580
20. 20 Sethi S et al. Int J Reprod Contracept Obstet Gynecol. 2021 Jun;10(6):2420-2426 www.ijrcog.org