

AN OBSERVATIONAL STUDY OF THE ROLE OF CALCIUM SUPPLEMENTATION IN LOW DOSE (500MG) VS HIGH DOSE (1000MG) IN PREVENTION OF PRE-ECLAMPSIA

Santwana Kumari¹, Anuj Kumar², Usha Kumari³

Received : 05/01/2024
Received in revised form : 01/03/2024
Accepted : 16/03/2024

Keywords:

Preeclampsia, Eclampsia, Calcium, Blood Pressure, Proteinuria.

Corresponding Author:

Dr. Anuj Kumar,
Email: anujdmch@gmail.com

DOI: 10.47009/jamp.2024.6.4.203

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (4); 1034-1037



¹Senior Resident, Department of Obstetrics and Gynecology, JLNMC, Bhagalpur, Bihar, India

²Senior Resident, Department of Anesthesiology, JLNMC, Bhagalpur, Bihar, India

³Professor, Department of Obstetrics and Gynecology, JLNMC, Bhagalpur, Bihar, India

Abstract

Background: The main aim of our study is to compare the high dose & low dose calcium intake to prevent preeclampsia & eclampsia. **Materials and Methods:** A prospective Interventional study was performed in OBG (IP&OP), JLNMC, a tertiary care teaching hospital, Bhagalpur, Bihar from June 2019 to May 2021. We had recruited 50 pregnant women. Study materials include Patient data collection proforma, Informed consent form. Subjects included in the study were pregnant women (above 4th month), gestational hypertension, Patient who are willing to participate in the study, Patients with previous and family history of HTN, Obese pregnant population, Patient of age group between 20-35 years. Subjects excluded from the study are Patients who were not willing to participate in the study, HIV patients and other comorbid conditions, Patients with multiple diseases. Subjects from the second trimester were recruited in the study based on inclusion and exclusion criteria. **Result:** Our study results shows that average mean Blood Pressure in low dose group was 109.33/72.66 and 110.33/76.33 and high dose was 125.00/84.33 and 104.333/69.667 before and after treatment respectively. By using SPSS Software results were analysed. By this comparison, we found extreme statistical significant difference between low dose Vs high dose calcium supplementation. Low dose calcium group has poor statistical significance [systole($p < 0.586$), diastole (0.125)], whereas high dose calcium group shows extreme statistical significance [systole($p < 0.0001$), diastole ($p < 0.0002$)]. **Conclusion:** Finally, we may conclude that high dose calcium supplementation is preferable than that of the low dose calcium in preventing the Preeclampsia and Eclampsia.

INTRODUCTION

Hypertension is a common disease that is simply defined as persistently elevated arterial blood pressure (BP). Normal Blood Pressure was. 130/90 mm Hg. Gestational hypertension and preeclampsia both are conditions occurring during pregnancy. Gestational hypertension is also called as pregnancy-induced hypertension (PIH). It is defined as high blood pressure measuring above 140/90mmHg in pregnant females without the presence of proteinuria and which occurs beyond 20 weeks of gestation. This high blood pressure occurs as a fresh occurrence without any prior history of hypertension in individuals.^[1]

Pre-eclampsia is a condition specific to pregnancy which typically occurs after 20 weeks of pregnancy. It is a combination of raised blood pressure (hypertension), protein in urine (proteinuria). BP

measured greater than 140/90 mmHg on two different occasions at least 4 hours apart. Proteinuria of greater than or equal to 0.3g in a 24 hours urine specimen. Pre-eclampsia is a major cause of maternal mortality and morbidity, preterm birth, perinatal death, and intrauterine growth restriction. In India the incidence of preeclampsia is reported to be 8-10% among pregnant women, the prevalence of hypertensive disorders of pregnancy was 7.8% with preeclampsia. According to a study in India, 10%-15% of maternal deaths are directly associated with preeclampsia and eclampsia.^[2] Eclampsia is extremely severe form of PIH characterized by sudden onset of generalized tonic clonic convulsions. It is a severe complication of preeclampsia and is a rare but serious condition where high blood pressure results in seizures or coma during pregnancy or immediately after pregnancy. Pathophysiology of eclampsia includes, in mild HTN or normotension: abnormal autoregulatory response

consisting of severe arterial vasospasm with rupture of endometrium & pericapillary haemorrhages with development of abnormal electric foci causing convulsion. In severe HTN, limit of auto regulation exceeded, vasodilatation occurs with hyper perfusion causing endothelial capillary damage and interstitial vasogenic edema.^[3-5]

Current WHO recommendations are 1.5–2 g/day calcium supplementation for low-calcium intake pregnant women to prevent complications.^[6] Low calcium intake may cause high blood pressure by stimulating either parathyroid hormone or renin release, thereby increasing intracellular calcium in vascular smooth muscle and leading to vasoconstriction.

A possible mode of action for calcium supplementation is that it reduces parathyroid release and intracellular calcium and so reduces smooth muscle contractility. By a similar mechanism, calcium supplementation could also reduce uterine smooth muscle contractility and prevents preterm labour and delivery. This hypothesis was tested in several randomised trials commencing in the late 1980s, which suggested a promising beneficial effect for calcium supplementation.^[7] The main aim of our study is to compare the high dose & low dose calcium intake to prevent preeclampsia & eclampsia.

MATERIALS AND METHODS

A prospective Interventional study was performed in OBG (IP&OP), JLNMC, a tertiary care teaching hospital, Bhagalpur, Bihar from June 2019 to May 2021. We had recruited 50 pregnant women. Study materials include Patient data collection proforma, Informed consent form. Subjects included in the study were pregnant women (above 4th month), gestational hypertension, Patient who are willing to participate in the study, Patients with previous and family history of HTN, Obese pregnant population, Patient of age group between 20-35 years. Subjects excluded from the study are Patients who were not willing to participate in the study, HIV patients and other comorbid conditions, Patients with multiple diseases. Subjects from the second trimester were recruited in the study based on inclusion and exclusion criteria. Patient related demographic details, past medical/ medication history, lab investigations were collected. After collection of data, B.P for each patient was monitored. The patients were divided into two groups randomly by using simple randomization technique i.e. Low dose calcium group 500 mg OD and High dose calcium group 500mg BID. Both the groups were followed for 4 follow ups and Hb, protein in urine levels and B.P were monitored. The results of both the groups were compared and the effect of calcium in preventing preeclampsia and eclampsia and also in reducing the incidence of pre term births and low birth weight were observed by measuring the parameters especially B.P.

RESULTS

Age Wise Distribution

We categorize the patient to their age groups ,out of 50 patients majority 29(58%) of them were found in between the age group 20-25 years, followed by 15(30%) in between the age group 26-30 years, followed by 6 (12%) in between the age group of 31-35.

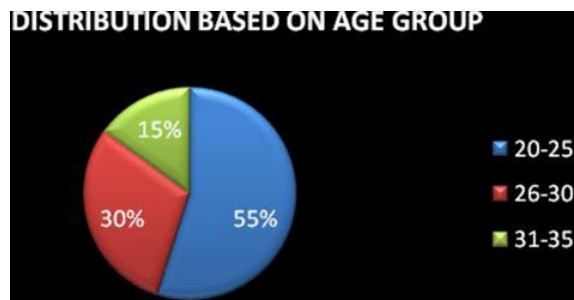


Figure 1: percentage of no. of patients according to their age

Treatment Outcome in Multigravida

We have categorize the patients based on their number of pregnancies. [Figure 2] shows patients with primi are 7, their average B.P before treatment was 116.94/77.96 and after treatment was 107.28/72.88; followed by patients with G2 were 17, and their average B.P was 117.01/78.07 and 107.54/72.98; patients with G3 were 20 and their average B.P was 117.57/78.61 and 107.33/73; Patients with G4 were 4 and their average B.P was 117.94/78.97 and 107.17/72.56; patients with G5 were 2 and their average B.P was 120.95/81.42 and 106.66/71.90 before treatment and after treatment respectively.

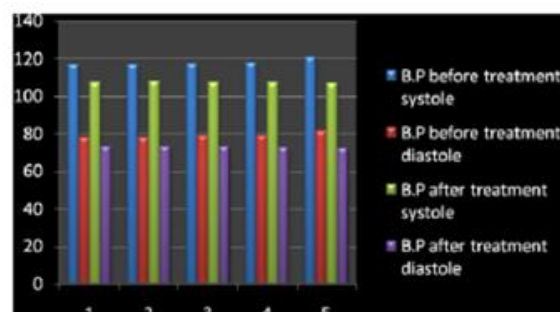


Figure 2: Treatment outcome in multigravida

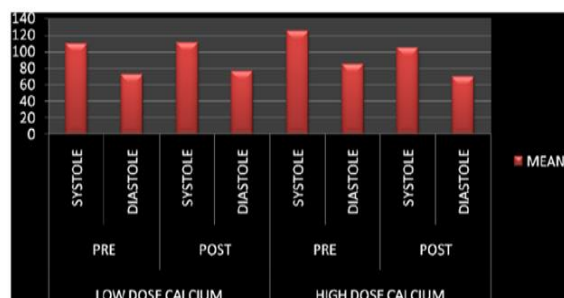


Figure 3: Comparison of Average Blood Pressure between Low Dose Group and High Dose Group

Comparison of Average Blood Pressure between Low Dose Group and High Dose Group

Explains the average values and interpretation of comparative groups (i.e. low dose and high dose). The average mean of B.P in low dose group was 109.33/72.66 and 110.33/76.33 and high dose was 125.00/84.33 and 104.333/69.667 before and after treatment respectively.

Assessment of Proteinuria and Serum Calcium Levels

We have performed proteinuria levels at the day of recruitment and in each follow up. Among 50 patients we had found 13 patients with proteinuria levels at the time of recruitment and finally after the treatment we had found the normal protein levels among those patients. We assessed serum calcium levels at the last month of gestation for hypo or hypercalcemia levels and we came to know that no patient have fluctuations in their serum calcium levels.

Assessment of Post Labour Parameters [Pre-Term Births and Low Birth Weights] Pre-Term Births: Among 41 patients we had found that no patient had their labour before 36 weeks of gestation. Low Birth Weights:

All most all the 41 patients had their healthy babies with normal weight. The mean average weight of 41 babies was found to be 2.697.

DISCUSSION

We categorize the patient to their age groups, out of 50 patients majority 29(58%) of them were found in between the age group 20-25 years, followed by 15(30%) in between the age group 26-30 years, followed by 6 (12%) in between the age group of 31-35. From this study we have concluded that patients in the age group of 30-35 were more prone to PIH disorders.

In our study, we had recruited gestational HTN patients and they were prescribed with calcium supplementation which results in decreased progression to preeclampsia, which is supported by Shakuntala Chhabra et al,^[8] and Lawrie TA et al.^[9]

In our study, we have performed proteinuria levels at the day of recruitment and in each follow up. Among 50 patients we had found 13 patients with proteinuria levels at the time of recruitment and finally after the treatment we had found the normal protein levels among those patients.

In our study, we had found the decreased risk of preeclampsia among women who are at increased risks of eclampsia, which is supported by Leonelo E. Bautista et al.^[10]

In our study, among 50 patients, 41 had their labour in term and no preterm deliveries were observed (i.e. before 36 weeks of gestation), here we can conclude, by prescribing enough calcium supplementation (according to WHO-2 gm/day requirement) for pregnant women will dramatically decrease the risk of preeclampsia and preterm births, which is supported by Hacker AN et al,^[11] Azar

Aghamoheemad et al,^[12] Sarah Bruyn Jones et al,^[13] and Sammya Bezerra Maia E Holanda Mouria et al.^[14]

In our study, by the use of high dose calcium supplementation during pregnancy reduces the risk of preeclampsia and preterm birth when compared to low dose calcium supplementation. Calcium also have a role in reducing placental abruption, incidence of preeclampsia, LSCS and low birth weight (<2500 gms), which is supported by Lucy Mackillop et al.^[15]

In our study, after prescribing calcium supplementation, no maternal deaths were observed, which is supported by Erika Barbosa Camargo et al.^[16]

In our study, as per our follow ups, we found that all the mothers and babies were very healthy after their delivery, as per our aim, we can conclude that supplementation of calcium helps in improving the health of mother and baby during pregnancy, also helps in preventing the risk of preeclampsia and premature births, which is supported by Brain P.Randall et al.^[17]

In our study period, out of 41 deliveries, 20(58.82%) were NVD, by this we conclude that calcium supplementation during gestational period may reduce the incidence of LSCS, perinatal deaths. Calcium also directly effects on smooth muscles to reduce contractility and prevent preterm labour, which is supported by Richard J.Levine et al.^[18] We have measured B.P at each follow up .For low dose calcium group, the mean average B.P at baseline was found to be 109.33/72.66 and mean average B.P at final follow up was found to be 110.33/76.33.For high dose calcium group, the mean average B.P at baseline was found to be 125.00/84.33 and at final follow up 104.33/69.667. By this comparison, we found the extreme statistical significance difference between low dose Vs high dose calcium supplementation. Low dose calcium group has poor statistical significant [systole (p<0.586), diastole (0.125)], where as high dose calcium group shows extreme statistical significant [systole (p<0.0001), diastole (p<0.0002)]. In our study, as we are prescribing calcium supplementation for pregnant women included in the study, we assessed their calcium levels for hypo or hypercalcemia, as we are prescribing more dose than normal. After assessment we found no fluctuations in serum calcium levels and more over their babies may have good bone strength. Our study results were also supported by Win Khaing et al,^[19] Moshood O Omotayo et al,^[20] Dr.Lisa Watson et al,^[21] Jason Waugh et al,^[22] Tito Silvio Patrelli et al,^[23] Aamer Imdad et al,^[24] G Justus Hofmeyr et al,^[25] L.Duley et al.^[26]

CONCLUSION

With this study we concluded that the high dose calcium supplementation to the pregnant women will have more beneficial effects when compared to that of the low dose calcium supplementation. Most of the

supporting literature is review articles; this study may be the first research work which concludes the benefits of high dose calcium supplementation. After the treatment with the calcium, there is the decrease in B.P in the patients with the high risk of attaining pre eclampsia. In case of high dose calcium the difference in decreasing B.P is more and extremely significant when compared to low dose calcium. Hence here we can prove that by giving the high dose calcium supplementation may be very helpful in preventing the preeclampsia which in turn prevents eclampsia. Finally, we concludes the high dose calcium supplementation is preferable than that of the low dose calcium in preventing the preeclampsia and eclampsia.

REFERENCES

1. Roger&walker;Text book of clinical pharmacy &pharmacotherapy;5thedition;Churchill livingstone Elsevier;2012;page no.295.
2. The Text Book Of Hypertension In Pregnancy;American College Of Obstetricians And Gynecologists;2013; developed by the task force on HTN in pregnancy;page no.13-17.
3. Eric A P Steegers, Peter von Dadelszen, Johannes J Duvekot, Robert Pijnenborg ;Pre-eclampsia;Lancet Aug,2010;376; 631-44 [internet] cited on dec 2017; available in <http://www.thelancet.com/journals/lancet/article/PIIS0140673610602796/abstract>.
4. Dr Bobby Krishnachetty, Southend University Hospital, UK Dr Felicity Plaat;Management Of Hypertensive Disorders In Pregnancy Anaesthesia Tutorial Of The Week 304 ;3rd March 2014.
5. Pathophysiology Of Eclampsia;Williams and Galemeau publishers; Department of Obstetrics and Gynecology, Rowan School of Osteopathic Medicine, Stratford, NJ, USA; October 2015.
6. Dietary requirement of calcium; The magazine of publication of the national institutes of health and friends of national library of medicine.[internet]cited on Dec 2017;available in; <https://medlineplus.gov/magazine/issues/winter11/articles/winter11pg>.
7. GJ Hofmeyr, JM Belizan, P von Dadelszen,etal;Low-dose calcium supplementation for preventing pre-eclampsia : a systematic review and commentary; BJOG An International Journal of Obstetrics and Gynaecology;2014;121;951-57.
8. Shakuntala Chhabra et al; Role of Calcium in Hypertensive Disorders of Pregnancy;Journal Of Nutritional Disorders And Therapy(ISSN); May 2017;7(2): 212-17.
9. Lawrie TA et al; Calcium supplementation during pregnancy for preventing Pre-eclampsia; NCBI; June 2014; 19(3): 1059.
10. Leonelo E. Bautista et al; Calcium and linoleic acid supplements in the prevention of pre eclampsia; Colombia Medica; March 2016;47(1): 156-161.
11. Hacker AN et al; The Benefits of Calcium During Pregnancy; NCBI; Jan 2017; 70(7): 397-409.
12. Azar Aghamohammad et al; Calcium supplementation in pregnancy and prevention of hypertensive disorders in elderly women; Science Asia; August 2015; 41(10): 259-62.
13. Sarah Bruyn Jones et al; Calcium Supplements Reduce Risk of Preeclampsia, Preterm delivery; International Journal Of OBG; July2014; 7(1): 531-35.
14. Sammya Bezerra Maia e Holanda Moura et al; Prevention of Preeclampsia; Journal Of Pregnancy; November 2012; 10(11): 506-7.
15. Lucy Mackillop et al; Pre-eclampsia; reducing the risk with calcium supplements; BMJ; December 2015; 10(12):1402-13.
16. Erika Barbosa Camargo et al; Survey of calcium supplementation to prevent preeclampsia; BMC;November 201; 43(10): 87-91.
17. Brain P. Randall et al; Calcium Supplementation During Pregnancy May Help Decrease Maternal Death and Morbidity and the Risk of Pre-eclampsia and Premature Birth; BJOG; December 2010; 24(6): 1002-8.
18. Richard J. Levine et al; Trial of Calcium to Prevent Preeclampsia; NCBI; June 1998; 337(2): 69-76.
19. Win Khaing et al; Calcium and Vitamin D Supplementation for Prevention of Preeclampsia: A Systematic Review and Network Meta-Analysis;MDPI; October 2017; 9(10): 1141.
20. Moshood O Omotayo et al; Calcium Supplementation to Prevent Preeclampsia: Translating Guidelines into Practice in Low-Income Countries; Advances in Nutrition- An International Review Journal; March 2016; 7(2): 275-78.
21. Dr Lisa Watson et al; Importance of calcium supplementation during pregnancy; ISSN; December 2014; 96(10): 64-72.
22. Jason Waugh et al; Low dose aspirin and calcium supplementation for prevention of preeclampsia; Royal College Of Obstetricians And Gynecologists; July 2014; 44(12): 2455-59.
23. Tito Silvio Patrelli et al; Calcium supplementation and prevention of preeclampsia: a meta-analysis; Journal Of Maternal Fetal And Neonatal Medicine; August 2021; 25(12): 2570-74.
24. Aamer Imdad et al; Role of calcium supplementation during pregnancy in reducing risk of developing gestational hypertensive disorders: a meta-analysis of studies from developing countries; BMC; April 2022; 11(3): 1471-78.
25. G Justus Hofmeyr et al; Calcium supplementation during pregnancy for preventing hypertensive disorders; Journal Of Cochrane Data Base; June 2023; 10(1): 1059-63.
26. L. Duley et al; Dietary calcium supplementation for prevention of pre-eclampsia and related problems: a systematic review and commentary; BJOG; June 2024; 114(8): 933-43.