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SERUM CALCIUM LEVEL AND PREGNANCY INDUCED HYPERTENSION

1. **RAKHSHANDA AKHTER**
2. **FOUZIA PERVEEN**
3. **SYEDA RABIA**
4 **SAIMA SALEEM**

1. ***Resident Medical Officer,***
Gynae & Obstetric Unit-II
Dow Medical Sciences & College,
Civil Hospital Karachi & Dow
University Health & Sciences
2. ***Associate Professor,***
Gynae & Obstetrics.
Dow Medical Sciences & College,
Civil Hospital Karachi & Dow
University Health & Sciences
3. ***Asst. Professor,***
Gynae & Obstetrics
Dow Medical Sciences & College,
Civil Hospital Karachi & Dow
University Health & Sciences
4 ***Resident Medical Officer.***
Dow Medical Sciences & College,
Civil Hospital Karachi & Dow
University Health & Sciences

Corresponding Address:
1. **DR. RAKHSHANDA AKHTER**
MBBS, FCPS.
142/N, G3 Asma Homes,
Block-II, PECHS Society, Karachi.
E-mail :
muhammadkamran2007@gmail.com

ABSTRACT

Pregnancy induced hypertension (PIH) is one of the major causes of maternal and most studied conditions associated with PIH which may be reduced by calcium supplementation.
Objective: To compare mean serum calcium level among normotensive and pregnancy induced hypertensive women presenting in tertiary care hospital.
Methods: The study was carried out in outpatient department of Gynae and Obstetrics from Feb to August 2010. It was a case control study and 30 PIH patients between 15-40 years and 30-42 weeks gestation with singleton fetus were enrolled as cases and 30 normotensive women with similar age and gestation age were included as controls. Both groups were given calcium supplementations in same dosage. Pregnant women with essential hypertension, renal disease, heart disease, UTI and diabetes were excluded. Blood sample of 3cc was collected for serum calcium level. Aga, gestational age, serum calcium level, educational status and monthly income was noted in the proforma. Data analysis was done by SPSS-15. Mean and SD was calculated for age, gestational age and serum calcium level. Frequency of educational status and monthly income was calculated by Chi-Square tests. Unpaired t-test was applied to compare mean serum calcium level between two groups. Relationship of calcium level with gestational age was estimated by logistic regression.
Results: There was no significant difference in the mean age and gestational age of both groups. But significantly low serum calcium level found in PIH group as compared to control group (7.91±0.935 vs 9.09±0.837 mg/dl). Gestational age 38 to 40 weeks had approximately 3 times greater risk of hypocalcemia (OR = 2.62) as compared to gestational age 34 to 37 weeks.
Conclusion: Significantly low level of serum calcium was found in women with PIH verses normotensive women, thus supporting the association of serum calcium level with this disorder of pregnancy.

Key words: Serum calcium, pregnancy induced hypertension, normotensive, third trimester.

INTRODUCTION

Hypertension complicates approximately 9% of all pregnancies worldwide and pre-eclampsia & eclampsia are major causes of maternal and perinatal morbidity and mortality[1]. Each year upto 40000 women mostly in developing countries die of pre-eclampsia or eclampsia[2]. It is second most common cause of maternal death in Pakistan. Insufficient calcium intake is found to be the most studied conditions associated with pregnancy induced hypertension (PIH). The hypothesis that calcium can be the predisposing factors was first put forward in 1980. The Mayan Indians in south America have a high calcium intake from the lime lime which their corn is soaked have a low incidence of pre-eclampsia[3]. Women with low calcium intake have an increase in mean blood pressure which predisposes them to PIH during the last part of gestation. The low level of maternal total calcium is due to an increase in the fetal calcium demand and due to increase maternal oestiogen which blocks bine resorption[4]. As a compensatory mechanism

parethormone production increases which increases intestinal absorption but at the same time it increases free intracellular ionized calcium which causes vasoconstriction and a rise in blood pressure. Calcium supplementation reduces this hyperparthyriod state therefore decreases intracellular calcium and the blood pressure[5]. The rationale of the study was that there is a relationship between low calcium level and PIH and no local study found about the mean calcium level in normotensive women and women with PIH. The aim of our study was to measure the mean serum calcium level in normotensive women and women with PIH.

MATERIAL AND METHOD

It is a case control study carried out in OPD of Civil hospital, Karachi from February 2010 to August 2010. Samples were collected by nonprobability purposive technique.

Inclusion criteria was all primigravidae with singleton pregnancy between 15 to 40 years of age and gestational age ranging between 30 to 40 weeks calculated from last menstrual period and supported by first trimester dating ultrasound. A total of 60 patients were sampled in outpatient department. Patients developing pregnancy induced hypertension (systolic B.P. > 140 mm of Hg and Diastolic B.P. > 90 mm of Hg for the first time after 20 weeks gestation) were registered as cases (30 in no.) while those who remained normotensive (30 in no.) served as controls. Both groups were given same dose and brand of calcium supplementation during the study. Informed consent was taken regarding the purpose, procedure, risks and benefits of study and with the assurance of confidentiality. Blood pressure was measured by the researcher herself by auscultatory method. Blood sample of 3 cc was collected in a syringe and sent for estimation of calcium level. Maternal age, educational status, monthly income and calcium level were noted in a predesigned proforma. Statistical analysis was performed by SPSS version 15. Mean ± SD was calculated for age, gestational age and serum calcium level in both groups. Unpaired t-test was utilized to compare the mean of both groups, while the frequency of educational status and monthly income was calculated by Chi square test.. Relationship of mean calcium level and gestational age was assessed by employing logistic regression. Statistical significance was taken as $P < 0.05$.

RESULTS

A total of 60 women studied, out of which 30 women were from normotensive group and 30 from PIH group. Mean age of PIH group was 22.4 ± 4.05 years while normotensive women was 22.13 ± 3.16 years which was statistically insignificant. Mean gestational age was 36.8 ± 1.56 weeks for PIH group and 37.2 ± 1.7 for control group which was also insignificant statistically. Majority of patients belonged to low income class (91.7%) and were illiterate (83.3%) in both groups. Mean serum calcium level was found significantly low in PIH group as compared with control group (7.91 ± 0.935 vs 9.09 ± 0.837) mg/dl. Mean serum calcium level has no association with age distribution but as the gestational age increased from 34-37 weeks group to 38-40 weeks group the risk of hypocalcemia increased 3 times (OR = 2.62).

DISCUSSION

About 5% of all pregnant women develop pre-eclampsia & the search for an effective preventive therapy has therefore been a major focus of obstetrical investigation. Cochrane review concludes calcium supplements help in preventing pre-eclampsia, preterm birth and lower the risk of the women dying or having serious problems related to high blood pressure in pregnancy especially in communities with low dietary calcium intake[6].

One study reveal there is small but insignificant increase in serum ionized calcium levels in the calcium supplemented group during the treatment period[7]. We have used calcium supplementation in both groups in similar dosage and measured the change in calcium levels in both groups which is found to be significantly low in PIH group. The biologic demand for calcium during pregnancy is greatest during adolescence, when calcium is needed for both maternal and fetal growth, The youngest women, therefore might be expected to derive the greatest benefit from calcium supplementation however our study does not show age related effect on mean calcium level.

The role played by calcium in the pathogenesis of PIH is nowadays receiving growing interest and the studies carried out on this subject revealed conflicting results. Belzan et al also reported significantly lower maternal total calcium levels in PIH than in normal pregnant women as found in our study[8]. A study from Saudi Arabia revealed mean serum calcium level in PIH group ranging from 8.0 to 8.8 mg/dl as compared to normotensive group (9.4 to 9.8 mg/ dl)[9]. Other authors reported similar statistically significant fall in serum ionized calcium level in PIH cases as compared to normal pregnancy cases[10].

Calcium supplementation may play a beneficial role in the prevention of PIH by maintaining plasma ionized calcium levels within the narrow physiological range. Studies have shown that maintaining this range is crucial for the ongoing synthesis of vasoactive substances such as prostacyclin and nitric oxide in the endothelium and consequently for a normal endothelial function and thus lowering the blood pressure[11]. The blood pressure lowering effect of calcium supplementation is demonstrated clearly by multiple studies on healthy population, as well as in populations with mild to moderate hypertension. Repke and Villar observed 65% reduction in serum parathyroid harmone. The fall in serum parathyroid harmone by nutritional calcium supplementation results in overall reduction in intracellular ionized calcium thus relaxing the myocyte

TABLE

MEAN AGE, GESTATIONAL AGE AND SERUM CALCIUM LEVEL

	Control group	Case (PIH) group	P-value
Age (years)	22.13 ± 3.16	22.43 ± 4.05	0.75
Gestational age (Weeks)	37.23 ± 1.67	36.8 ± 1.56	0.304
Serum calcium level (mg/dl)	9.09 ± 0.83	7.9 ± 0.93	0.001

at arteriolar level and causing lowering of blood pressure[12]. Studies also reveal maternal calcium supplementation in pregnancy may program the cardiovascular control systems resulting in lower blood pressure also in the offspring[13]. In contrast many studies reveal 2 gm of calcium supplementation daily does not reduce the incidence or severity of PIH[14,15]. This study has certain limitations which are the small sample size and the other is vertical study is not carried out in the same sample.

CONCLUSION

In summary significant relationship found between low serum total calcium level and PIH as also documented in literature. The decline in serum level with gestational age suggests calcium supplementation during late pregnancy may prevent development of PIH. However more studies should be carried out in this field as the available evidence does not conclusively demonstrate the actual mechanism.

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