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PRE-ECLAMPTIC AND NORMOTENSIVE PREGNANCIES;

COMPARISON OF SERUM CALCIUM LEVELS

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ABSTRACT… Background: Pre-eclampsia along with its consequences is one of the primary driver of maternal morbidity and horribleness. Despite the availability of magnificent literature, the onset of pre-eclampsia has yet not been fully understood. **Objectives:** To compare the serum calcium level among pre-eclampsia and the normal women during pregnancy. **Patients and Methods: Study Design:** Hospital based case control study. **Setting:** Gynecology Department of Jinnah Hospital Lahore. **Period:** 1st July 2014 to 31 December 2014. The study groups consist of the 30 pre-eclamptic subjects and women with normal pregnancies. The serum calcium level of the subjects under this study was determined using standard colorimetric analyzer. **Results:** The results of our study determined that serum calcium level among the pre-eclamptic and the normotensive pregnant women was statistically significantly lower as compared to the normal pregnant women. **Conclusion:** The findings of current work are statistically significant to establish that concentration of serum calcium among pre-eclamptic subjects is lower than in the normotensive women during pregnancy.

Key words: Serum Calcium, Preeclampsia, Pregnancy.

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INTRODUCTION

Women usually suffer from elevated blood pressure after 20th week of their pregnancy called the pregnancy induced hypertension (PIH) which is characterized by abnormal blood pressure, protein-urea and resultant edema.[1] Its complication is called pre-eclampsia although a transient phase but associated with dangerous pregnancy outcome for which different theories have been put forward to explain its reasoning.[2] The pregnancy related hypertension is responsible for about more than 9% of all the complication from all over the world including preeclampsia and eclampsia being the major reasons for prenatal morbidity and mortality.[3] From the literature search, maternal mortality is already very high in our country, the estimated figure is 1 out of 89 women die because of preeclampsia and eclampsia.[4] From other studies data more than 14% of the death due to maternal causes are due to eclampsia and preeclampsia from all over the world.[3,4]

The figure for incidence of preeclampsia from all over the world is around 5-10% out of all the pregnancies, the data from India indicates its incidence from 5 to 15% the highest reported incidence in nullipara to be 15% and in multipara about 10%, while its incidence from our country is about 19%.[5] The important clinical feature of preeclampsia are raised B.P with protein-urea, usually with lower extremities edema, there is sudden weight gain among women, feel headache and there are reports about changes in vision in late 2nd to 3rd trimester of the pregnancy.[5] Although it is more common, but yet less understood problem of the pregnancy related complication as well.[2,5]

Literature search from the reproductive health studies reveals that the pregnancy induced hypertension is associated by imbalance in

the vascular production of prostaglandins to be the most likely mechanism to be involved for alteration in the vascular activity. As we know, the prostaglandins are responsible for the vasodilatation state, their decrease level causes an increase to angiotension-2 among the pregnant women which make them susceptible for preeclampsia. The serum calcium level play an important role for regulating the prostaglandin synthesis through activation of the phospholipase membrane, it has been reported by several studies that the low serum calcium level among patients of pregnancy induced hypertension.[6]

Another mechanism for women with pregnancies with hypertension have been explained in association with presence of chorionic villi due to incites vasospasm as well. The key feature involved in this mechanism is thought to be the placental oxidative stress as the pathogenesis for eclampsia and patho-physiological not a success of trophoblastic invasion in the spiral arteries that leads to mal-adaptation of maternal spiral arterioles responsible for vascular resistances of uterine arteries and also a decrease of placental perfusion.[5,6]

PATIENTS AND METHODS

This case control hospital based study was conducted from 1st July 2014 to 31st December 2014 at Gynecology Department of Jinnah Hospital, Lahore. Sixty women were included. Thirty females with pregnancy-induced hypertension admitted following 20th week of pregnancy were the study population. Thirty females with age matched, similar gestational period and without any history of PIH were selected as the control group. Serum calcium, serum albumin and spot urinary protein tests were done on these patients. Patients have 2nd and 3rd trimester of pregnancy, no previous H/O hypertension, age 20–40 yrs, blood pressure > 140/90mmHg and with and without proteinuria and ankle edema were included. Pregnant females in first trimester, pregnant females in 2nd and 3rd trimester without hypertension, previous history of hypertension prior to pregnancy and chronic Liver disease and Nephritis were excluded. 5ml of venous blood was collected in a syringe from the antecubital vein by taking aseptic precautions. Care was taken to prevent venous stasis during the sample collection. The blood was allowable to clot and the serum was separated by centrifugation at 2000 rpm for 10 minutes.

RESULTS

Table-I showed that in case group 2 females of 2nd trimester (6.7%) and 28 of 3rd trimester (93.3%). Similarly in control group 2 females of 2nd trimester (6.7%) and 28 of 3rd trimester (93.3%). Chi-Square test was applied and there is no statistical difference between the two groups in duration of pregnancy because p value >0.05.

Duration of pregnancy	Cases		Controls	
	No.	%	No.	%
2nd Trimester	2	6.7	2	6.7
3rd Trimester	28	93.3	28	93.3

Table-I. Duration of pregnancy in cases (30) and controls (30)
P = 1.000 (Not significant

In case group out of 30, 24 (80%) females have low mean serum calcium level and 6 (20.0%) have normal mean serum calcium level. In Control group 11 (36.7%) out of 30 have low mean serum calcium level and 19 (63.3%) have normal serum calcium level during pregnancy. There is statistical significant between the two groups in mean serum calcium level because p value <0.05 (Table-II).

Mean serum calcium level	Cases		Controls	
	No.	%	No.	%
Low (<8.5 mg/dl)	24	80.0	11	36.7
Normal (8.5–10.2 mg/dl)	6	20.0	19	63.3

Table-II. Serum calcium level in cases (n=30) and controls (n=30)
Chi square value =21.991 (P value = .000)

Table-III showed that in case group out of 30, 14 (46.7%) females have low mean corrected serum calcium level and 16 (53.3%) have normal mean corrected serum calcium level. In Control group 11 (36.7%) out of 30 have low mean corrected serum calcium level and 19 (63.3%) have normal corrected serum calcium level during pregnancy. There is no statistical significant difference between the two groups in mean corrected

serum calcium level because p value >0.05.

Mean serum calcium level corrected	Cases		Controls	
	No.	%	No.	%
Low (<8.5 mg/dl)	14	46.7	11	36.7
Normal (8.5–10.2 mg/dl)	16	53.3	t19	63.3

Table-III. Corrected serum calcium level in cases (n=30) and controls (n=30)
Chi square value = .617 (P value = .432)

Table-IV showed that in case group out of 30, 26 (86.7%) females have low mean serum albumin level and 4 (13.3%) have normal mean serum albumin level. In Control group 8 (26.7%) out of 30 have low mean serum albumin level and 22 (73.3%) have normal serum albumin level during pregnancy. There is statistical significant difference between the two groups in mean serum albumin level because p value <0.05.

Serum albumin	Cases		Controls	
	No.	%	No.	%
Low (<3.5 mg/dl)	26	86.7	8	26.7
Normal (3.5–5 mg/dl)	4	13.3	22	73.3

Table-IV. Serum albumin level in cases (n=30) and controls (n=30)
Chi square value =21.991 (P value = .000)

Table-V showed that in case group out of 30, 11 (36.7%) females are primigravida, 8 (26.7%) have 2-4 children and 11 (36.7%) have 5-7 children. In Control group 11 (36.7%) out of 30 are primigravida, 14 (46.7%) have 2-4 children and 5 (16.7%) have 5-7 children.

Parity	Cases		Controls	
	No.	%	No.	%
1st child	11	36.7	11	36.7
2-4 children	8	26.6	14	46.7
5-7 children	11	36.7	5	16.7

Table-V. Frequency and percentage of parity in cases (n=30) controls (n=30)

DISCUSSION

Hofmeyr et al[12] have laid emphasis on calcium supplements to assist to prevent pre-eclampsia for preterm birth and to lower the risk of maternal morbidity and mortality in relation to high hypertension `during pregnancy particularly in the areas where females have less calcium intake during pregnancy. The results of present study, cases of hypertensive pregnant females revealed low serum calcium level in 80%. These extracellular changes explain reason for convulsion among study subjects and eclampsia as small decrease in extracellular calcium leads to increased excitability and burst firing by alter physiologic and pathophysiologic processes through enhancing long-term potentiation.[13]

Gestational age has significant association for the development of pregnancy induced hypertension. It has been observed as the "gestational age increased from 34 to37 weeks and from 38 to 40 weeks group the risk of hypocalcemia increases by 3 times".[3] In our study in group 2 females of 2nd trimester (6.7%) and 28 of 3rd trimester (93.3%). Similarly in control group 2 females of trimester (6.7%) and 28 of 3rd trimester (93.3%) which is also not significantly different.[14]

At Saudi Arabia a study shown that "mean serum calcium level among pregnancy induced hypertension group, that ranges from 8.0 to 8.8 mg/dl as compared to the control normotensive ranging from 9.4 to 9.8 mg/ dl".[15] Indumati et al[16] also revealed similar statistically significant low level in serum total calcium level among pregnancy induced hypertension group subjects. In another study conducted by Idogun et al, the serum calcium level was statistically significantly higher in control group than the patient.[21,22] Mohieldein et al[24] revealed that "mean serum calcium of the study group was 8.38±1.04 mg % while the mean serum calcium of the control group was 9.04±1.13mg %. There was a statistically significant difference between the two groups (P<0.001)".[25]

In the present study, it has been observed that serum calcium levels decline significantly in the PIH cases as compared to the normal pregnancy cases was observed. This indicates an association between calcium deficiency and PIH the serum calcium level of the cases was 7.68±0.75 and of the controls was 8.73±.61 which is statistically significant. The serum calcium levels in cases in this study was similar to the results obtained by Idougon.[26,27]

There is consistency among the researchers for the phenomenon that that calcium supplements of about 2 grams of elemental calcium or 5 gm of calcium carbonate per day results in an overall lowering of blood pressure and an overall reduction in hypertensive disorder during pregnancy. The mechanism has been explained for blood pressure reduction due to shift of intracellular ionized calcium to the extracellular space resulting in smooth muscle relaxation. Bucher et al[20] reported that reduction in systolic blood pressure of -5.40 mmHg and in diastolic blood pressure of -3.44 mmHg, the with and odds ratio 0.38 at statistically significant result reported that calcium supplementation through pregnancy leads to a significant decrease in systolic and diastolic blood pressure and preeclampsia.

The effect of parity on development of hypertensive pregnancy has also been investigated by several authors. Study conducted by Sukonpan et al it shows that parity between normal and pre-eclamptic pregnant women is not significantl.[22] On the contrary several authors have observed a higher incidence of hypertensive pregnancy in primigravida. Rehman et al[23] in their study results have shwon that out of 370 patients with PIH, 265 patients were primigravida, the incidence being 71.62%. The remaining cases were multigravida. They also found that 20 out of 370 patients were hypertensive and were having multiple pregnancy (bearing more than one fetus), constituted 5.41% of the total. Eighty five elderly multigravida were also found to have hypertension, which makes about 22.97%. From this study it is concluded that PIH is basically a disease of primigravida. In our study, case group out of 30, 11 (36.7%) females are primigravida, 8 (26.7%) have 2-4 children and 11 (36.7%) have 5-7 children. In Control group 11 (36.7%) out of 30 are primigravida, 14 (46.7%) have 2-4 children and 5 (16.7%) have 5-7 children. Boler et al[29] demonstrated that determination of proteinuria is an alternate method to diagnose pre-eclampsia. 24-hours urine collection is the gold standard for determination of proteinuria. But hurdle in collection of 24-hours urine is difficulty in collection and handling for patient and staff that can be responsible for errors.

Brown et al stated that proteinuric hypertension has poor maternal and fetal outcomes than non-proteinuric hypertensive pregnancy. It is recognized that women with proteinuric pre-eclampsia have a poorer outcome than those with gestational hypertension (non-proteinuric) alone.30 Our study shows that in case group out of 30, 10 (33.3%) females are of pregnancy induced hypertension and 20 (66.7%) have pre eclampsia. Control group have no protein in urine during their pregnancy, statistical difference between the two groups was significant ($p<0.05$).

CONCLUSION

It is quite evident that in patients with pregnancy induced hypertension with preeclampsia there is much reduced serum calcium level. This lower calcium level with gestational age may have a temporal relationship with these pregnancy related complications. These may have been found useful intervention for the management of pregnancy induced hypertension and preeclampsia through use of calcium supplementation.

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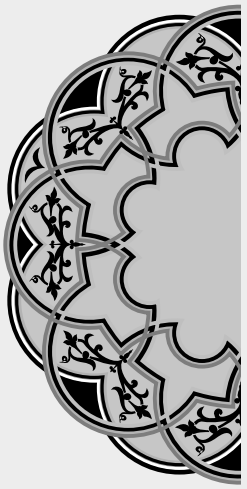

"Be smart enough to hold on, be brave enough to let go."

Unknown

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Muhammad Akram	Hypothesis Designing, Article Arrangement & Finalization	
2	Muhammad Faisal Nadeem	Focal to conduct research	
3	Dr. Ashba Anwar	Data Collection & Compilation	
4	Dr. Fareen Anwar Memon	Statistical Analysis & Table Preparation	
5	Dr. Muhammad Imtiaz Shafiq	Manuscript Design & Review	
6	Dr. Ali Raza Memon	Biochemical Analysis	