Research Article
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Value of serum calcium in preeclamptic Sudanese women

Abstract

Background: Preeclampsia is a pregnancy-related hypertensive disorder occurring in the second half of the pregnancy and is one of the major causes of maternal and fetal morbidity and mortality. Though the etiology is obscure, recent studies indicate that the levels of serum calcium may play a role in the development of preeclampsia. The aim of this study to find out the relationship of serum calcium in preeclamptic pregnancies compared to normal pregnancies.

Methods: This was a case control study carried out at Bahari Hospital which included 100 women with preeclampsia in the third trimester of pregnancy as a study group and 100 healthy pregnant women in their third trimester of pregnancy as a control group with similar maternal and gestational age. The concentration of the corrected total serum calcium was measured by measuring total serum calcium and serum albumin using a spectrophotometric method. Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 23.

Results: The age of the participants was (18-45) years old, with gestational age ranging from (34-36) weeks, there was no significant difference between the two groups in their age, gestational age, with p value (0.5) and (0.2) respectively. Plasma calcium level was lower in preeclamptic women as compared to healthy control subject, the mean value of plasma calcium levels were (7.1±0.8) mg/dl and (9.6±0.4) mg/dl, in study and control groups respectively, the difference in the mean were statistically significant with p value (0.001).

Conclusion: Hypocalcaemia related to preeclampsia supports the hypothesis that alternation in the total serum calcium levels may be involved in the possible pathogenesis of preeclampsia.

Keywords: eclamsia, preeclampsia, calcium

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Introduction

Preeclampsia is a pregnancy-specific multi-systemic disorder characterized by proteinuria and the onset of hypertension during pregnancy.[1] Preeclampsia is estimated to occur in 3–5% of pregnancies.[2] Preeclampsia is an unpredictable pregnancy specific condition characterizes by new onset hypertension and either proteinuria or end organ dysfunction after 20 weeks gestation in a previously normotensive women.[3] Preeclampsia and related hypertensive disorders of pregnancy continue to be a global problem, they constitute the top 5 causes of maternal mortality in the world.[4] Worldwide 76,000 pregnant women and 500,000 babies die each year from Preeclampsia and related hypertensive disorders.[5] In developing countries, 15-20% of maternal mortality is attributable to preeclampsia.[6] Women with Preeclampsia have also an increased risk of developing stroke, hypertension and IHD later in life, their daughters also have the risk of developing the same complications.[7–11] The incidence of preeclampsia worldwide is a round 5-10%.[12] Routine calcium supplementation is recommended during pregnancy to prevent preeclampsia.[1]

Materials and methods

This study Prospective case control study, carried out at Bahari hospital, in the obstetric department throughout the first of March to the 15 of September 2016. One hundred patients were selected as the Study group; also the study included one hundred pregnant women, who served as the control. The control patients were randomly selected from the outpatient obstetric clinic. All pregnant women diagnosed with preeclampsia which is defined as the development of high blood pressure after 20 weeks of pregnancy with proteinuria (> 300 mg/day) were included and excluded patients with a history of chronic hypertension, patient known case of cardiovascular disease, diabetes mellitus, thyroid and any systemic illness, multiple gestations and hydatiform mole. Written approval was obtained from director of the obstetric department at Bahari hospital, and the director of chemical laboratory department at Omdurman military hospital, and verbal consent was taken from the patients. The study used a constructed questionnaire to collect the data. Information collected from participants included, age, gestational age, parity, drug history, blood pressure and proteinuria. Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 23.

Results

This study enrolled two hundred pregnant women at third trimester of pregnancy. One hundred women were normotensive and served as the control group. The other one hundred women were preeclamptic and served as the study group.

The ages of the women in this study ranged from 18 to 45 year olds, most of the population being between the ages of (18-29). Age distribution is shown in Table 1.

Gestational age of these women ranged between 34 to 36 weeks, with most of them at 36 weeks. Gestational age distribution is shown in Table 2. With consideration to parity most of women were primigravidas, distribution of parity in shown in Table 3. 65% of

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women with preeclampsia had family history in their first degree relative, while 35% show no family history. 70% of multiparies and grandmultiparies with preeclampsia had previous history in their first pregnancy. The levels of corrected serum calcium were found to be normal for all women in the control group with mean corrected calcium of 9.6mg/dl, while the level of corrected calcium in the study group was found to be low, with the mean 7.1 mg/dl, with the exception of a few outliers. Eight out of the 100 women had normal levels of corrected calcium, when comparing these two groups; the p-value was calculated to be (0.001) which is considered to be statistically significant. Considering the correlation between parity and corrected calcium levels for the study group, primigravida had an average corrected calcium level of 7.4 mg/dL (±0.9SD) with a p-value of (0.004), multiparies had an average calcium level of 6.9mg/dL (±0.7SD) with a p-value of (0.001) and grandmultiparies had a mean corrected calcium level of 6.7mg/dL (±0.2 SD) with a p-value of (<0.0001).

Table 1 Age distribution among enrolled pregnant women (No 100)

Control group	Number	Case group	Number
18-29	64	18-29	60
30-39	34	30-39	36
40-45	2	40-45	4

Table 2 Gestational age among enrolled women

Control group	Number	Case group	Number
36 weeks	75	36 weeks	70
35 weeks	15	35 weeks	20
34 weeks	10	34 weeks	10

Table 3 Distribution of parity among enrolled women

Control group	Number	Case group	Number
Primigravidas	52	Primigravidas	50
Multiparies	44	Multiparies	46
Grandmultiparies	4	Grandmultiparies	4

Discussion

Preeclampsia is a pregnancy specific complication associated with increased maternal and prenatal morbidity and mortality although many pathophysiological factors have been implicated in the etiology. Its etiology is still under investigation. This study shows a significant relationship between hypocalcaemia and Preeclampsia. These finding correlates with the studies conducted internationally by KanChapon, SukonpanVorapang, Pha Pong 2005, which compared serum calcium and magnesium levels in preeclamptic women and found hypocalcaemia to be a possible etiology of preeclampsia. Also a study done at King Hussein Medical Center 2001 found that low serum calciumlevel has a role in preeclampsia. Another study of KistersBareubrock, M Lowwer, FhausBer, 2000, also observed hypocalcaemia in preeclamptic patients. In a study of Gerand J. Sanders, Wenk J. Hugger 1999, found that there is an inverse relationship between serum calcium levels and preeclampsia and found that calcium supplementation is found to lower blood pressure in pregnant women. Overall these studies were suggesting a strong relationship between hypocalcaemia and the risk of developing preeclampsia. In this study, it was noted that there was a general trend between the average corrected calcium levels and the parity, this finding correlate to study conducted at Nishtar hospital Multan 2017, which found low serum calcium is associated with increasing parity, another study done at RasheedShekoni Specialist Hospital, Dutse, Jigawa State Nigeria 2016, which done to evaluate the prevalence of hypocalcemia in pregnancy and puerperium found that high parity is likely risk factor for hypocalcemia. Also this study shows, previous history of preeclampsia is a strong risk factor ,this finding correlate with several studies done nationally, study done at Arch Iran Med.2011 Nov which evaluate risk factor of preeclampsia, found that history of preeclampsia during previous pregnancy is a risk factor with p =(0.003). In a study conducted in Obstetrics and Gynecology Ward of tertiary care hospital in Delhi, India 2013 found that PH of preeclampsia associated with development of preeclampsia. Also this study shows increased incidence of preeclampsia among primigravidas, this finding correlate with study done nationally at Pakistan, Aga khan University Hospital, Stadium Road, Karachi-74800, 2013 which found that nulliparity is one of the risk factors which can be used to assess risk at booking, another study among pregnant mothers in Cairo, Egypt conducted in the Obstetrics and Gynecology Department In Al-Hussein Hospital, Al Azhar University 2011; 7 showed that primigravida is a major risk factor.

Conclusion

The results of this study showed that most of the preeclamptic women were hypocalcaemia with mean plasma calcium level of (7.1±0.8). Family history and past history of preeclampsia were significant risk factors, also increased incidence of preeclampsia among primigravidas. Increased incidence of hypocalcaemia with increased parity. So measurement of serum calcium levels for any pregnant women should be performed to detect hypocalcaemia which is associated with preeclampsia. Further studies could be done to show if there is a correlation between the severity of preeclampsia and hypocalcaemia.

Acknowledgments

None.

Conflicts of interest

The authors have no conflict of interests related to this study.

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