



Serum calcium level and some physiological markers during Pre-eclampsia and normal pregnancy in Babylon province women

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Abstract

Background: preeclampsia (PE) is a pregnancy – related hypertensive disorder occurring in the second half of the pregnancy. The calcium mineral has been proposed to play important role in the pathogenesis of preeclampsia.

Subjects and methods: The data was collected from 50 normal pregnant women, 35 mild preeclamptic women and 30 severe preeclamptic women who were admitted in the Babylon maternity and pediatric teaching hospital between February 2012 and December 2012. The blood samples were collected and analyzed for serum total calcium, serum ionized calcium, serum albumin. The data on body mass index (BMI), a maternal and gestational ages, blood pressure (BP) values were collected and the data were analyzed using analysis of variances (ANOVA).

Results: The (BMI) and (BP) values in the preeclamptic women were significantly higher than those of individuals with normal pregnancy ($p < 0.001$), the serum total calcium (Ca) and serum albumin (Alb) levels were highly significant lower in hypertensive pregnant in comparison with healthy ones ($p < 0.001$), while ionized calcium levels had no significant difference between mild preeclamptic women ($p > 0.05$) as comparison with normal pregnancy, but were significant lower ($p < 0.05$) in the severe preeclamptic women as compared with control and mild preeclamptic groups.

Conclusion: single estimation of total and ionized calcium, and serum albumin levels late in the second and third trimesters of pregnancy have a little value in the prediction of preeclampsia when the disease process was usually manifest, our study is recommended to properly performed not just these biochemical markers, additionally we must investigated the related vitamins that may be contribute in this disorder, and these tests must be early analyzed in pregnancy for prediction of the subsequent development of preeclampsia.

Key word: total calcium, ionized calcium, serum albumine, pre-eclampsia

Introduction

Pre-eclampsia (PE) is a transient but potentially dangerous complication of pregnancy that affect 3-5% of pregnancies [1]. It has been dubbed the "disease of theories" because of the multiple hypothesis have been proposed to explain its occurrence [2].

The syndrome of pre-eclamptic toxemia is characterized by hypertension, proteinuria, oedema and abnormal clotting, all of which can be explained by generalized vascular endothelial cell dysfunction [3].



This maternal hypertension develops after 20 weeks' gestation and is associated with >300 mg/day urinary protein excretion[4], the clinical spectrum of preeclampsia ranges from mild to severe depending on the level of the blood pressure(BP) and degree of protein urine[5], in most cases progression through this spectrum is low, and the disorder may never proceed beyond mild preeclampsia.

In other cases the disease progress more rapidly changing from mild to severe within days or weeks[6].

Epidemiological and clinical studies have shown that an inverse relationship exists between calcium (Ca) intake and development of hypertension in pregnancy[7,8], as regard that malnutrition is a risk factor in the etiology of preeclampsia and implicate it by deficit intake of calcium[9].

On physiological basis, calcium is the bodies' most abundant divalent cation, is an essential but controversial nutrient[10,11], in pre-eclampsia many factor affect calcium regulation and consider the causes of disturbed calcium balance[12], on the other hand the modification of plasma calcium concentration leads to alteration of blood pressure[13] with respect to this, the aberrations in calcium homeostasis have been recognized in hypertension in general and specifically in pre-eclampsia[14]

To facilitate understanding of (Ca) disturbance, it is helpful measure serum total calcium form, but this form sum of the ionized composed of (46.9%) which an alternate metabolic form of calcium with active physiological important and play a key role in the biochemical and metabolic functions[11] and the other, non ionized consist of (39.5%) protein bound mainly albumin, and (13.6%) diffusible calcium complexes [15] this reveal that calcium bound to albumin and ionized calcium is roughly in equal proportion [16] we conclude from this, the evaluate the total calcium in adjustment based on albumin to be suitable for fulfilled. The intended functions as a screening procedure in preeclampsic pregnant, As a result, our study carry out to estimate the role of these parameters in incidence of preeclampsia.

Subject and methods

This study was conducted in Babylon maternity and pediatric teaching hospital between February 2012 and December 2012 .

The studied population consisted of 50 apparently normal pregnant women as a control group , 35 pregnant women with diagnosis of mild preeclampsia and 30 pregnant women with diagnosis of severe preeclampsia, the three groups are included with age rang[20-40] years, and gestational age range [29-39] weeks. those pre-eclampsic pregnant were admitted to hospital for further investigations, monitoring, and/or delivery. subjects were excluded if they had chronic medical disease or were taking medications known to interfere with calcium metabolism such as corticosteroid ,thyroxine,heparin

Study tools and methods:

A- Diagnosis of(PE): All patients must be fulfilling the following inclusion criteria:

1 - Mild preeclampsia is defined as a blood pressure of at least 140/90mm/Hg measured on two occasions each 6 hours apart, accompanied by protein urine of at least 300 mg per 24h, or at least 1± on dipstick testing [6].



2-Severe pre-eclampsia is defined as having one or more the following criteria blood pressure of at least 160/110mm/Hg measured on two occasions each 6 hours apart, protein urine of at least 5g per 24h ,or at least 3+ on dipstick testing [6].

Two random midstream urine specimens, collected ≥ 4 hours apart taken from each women to avoid error due to false positive tests, the two results must be positive, so the diagnosis of protein urine was significant [17]

B-Clinical investigation

Two(Bp) reading were taken five minutes apart, on left arms with a mercury sphygmomanometer [cuff size, 12.5 × 40cm] The first and fifth phases of korotkoff's sounds were taken as the criteria for systolic blood pressure(SBP) and diastolic blood. Pressure(DBP) respectively [18] Participants height and weight was measured and recorded. Body mass index [BMI] in kg/m^2 is calculated by dividing baseline weight in kilograms by height in meters squared[19]

C-Laboratory Investigation:

Three milliliters of random venous blood were with drawn from each subject (control and patient) without application of tourniquet.

Samples then were transferred into clean new plane tube, left at room temperature for 15 minutes for clotting, followed by centrifugation at 2000xg for 5 minutes ,separated serum was transferred into Eppendrof tube, the tubes were stored at -20°C until analysis, which was done within one week after collection[20]

The assay for calcium was carried out colometrically using a kit supplied by [biomerieux company]and alb-kit to determine of albumin using kit supplied by [biolabo company]and are preformed using cecil spectrophotometer -1101 in the biochemistry lab[21,22] As calcium is predominantly transported bound to serum proteins, so total serum calcium level are greatly influenced by protein concentration especially albumin[23] for obtaining corrected total calcium value ,the same data was used according to the formula[24]:

$$\text{Corrected total Ca(mg/dl)} = \text{total Ca(mg/dl)} + 0.8(4 - \text{albumin g/dl})$$

As the ionized calcium that is physiological active and with clinically important [13] the same data used to calculate the ionized calcium according to the formula have been based upon plasma albumin[16]:

$$\text{Free or ionized Ca}^{+2} \text{ (mg/dl)} = \text{Ca measured in (mg/dl)} - [\text{albumin g/dl} \times 4/2]$$

D-Data analysis

The data was analyzed with(SPSS) software package version 18.0 and expressed in terms of mean standard deviation(SD) continuous variables of the clinical characteristics, and serum calcium and albumin values for the three group of participants were compared by F-test from analysis variances [ANOVA].

Then scheffe was used for post hoc comparisons if F-test had statistical significance. A(p value < 0.05) was considered to be statistically significant.

The results



The present study enrolled 115 pregnant women. The clinical characteristic of the participants are shown in[table1]

Age, gestational age among normal pregnant, mild and severe preeclamptic women were not significantly different.

Table 1.Comparisons of the Clinical characteristics for three groups of participant

	G1/normal pregnant N=50	G2/mild Preeclampsia N=35	G3/severe Preeclampsia N=30	Sig.		
				(1vs.2)	(2vs.3)	(1vs.3)
Age(years)	32.95±4.86	33.15±6.23	32.7±4.18	0.19	0.86	0.15
Gestational age (weeks)	33.55±3.03	33.75±3.29	33.9±3.32	0.85	0.88	0.73
DBP(mm/Hg)	71.50±7.45	95.00±5.13	115±5.13	0.000	0.000	0.000
SBP(mm/Hg)	115.00±6.88	146.00±5.02	170±8.58	0.000	0.000	0.000
BMI(kg/m ²)	32.33±5.21	36.06±4.45	35.66±3.90	0.01	0.78	0.02

Values are given as mean ± SD ; N=number

The mean difference is Significant at the 0.05 level

There was no significant difference in the BMI between mild and severe preeclamptic women ,but the BMI for mild and severe preeclamptic women were more than normal pregnant significantly ($36.06 \pm 4.45, 35.66 \pm 3.90 \text{ kg/m}^2$ vs. $32.33 \pm 5.21 \text{ kg/m}^2$, $p=0.01, p=0.02$ respectively).

There was a highly significant difference between normal pregnant and mild and severe preeclamptic women in blood pressure values, normal pregnant women had mean systolic blood pressure less than both mild and severe preeclamptic women($115.00 \pm 6.88 \text{ mm/Hg}$ vs. $146.00 \pm 5.02 \text{ mm/Hg}$, $p=0.00$;and $170 \pm 8.58 \text{ mm/Hg}$, $p=0.00$ Respectively) ,

Systolic blood pressure of severe preeclamptic women were more than mild preeclamptic women($170 \pm 8.58 \text{ mm/Hg}$ vs. $146.00 \pm 5.02 \text{ mm/Hg}$, $p=0.00$ Respectively). The results of our study show also that normal pregnant women had mean diastolic pressure less than mild and severe preeclamptic women($71.50 \pm 7.45 \text{ mm/Hg}$ vs. $95.00 \pm 5.13 \text{ mm/Hg}$, $p=0.00$ and $175 \pm 5.13 \text{ mm/Hg}$, $p=0.00$ respectively) .

As regard the laboratory results of maternal serum calcium and albumin level among the preeclamptic and control women explain in [table2],the serum total Ca and corrected total Ca were lower in the preeclamptic women G2 and G3 groups as compared to healthy control group G1 [$p<0.001$ for both] and even when compared between mild and severe preeclampsia group [$p<0.001$ for both]



Table 2. Comparisons of serum total calcium , ionized, and corrected total calcium and serum albumin for the three groups of participants

	G1/normal pregnancy N=50	G2/mild preeclampsia N=35	G3/severe preeclampsia N=30	Sig		
				(1vs.2)	(2vs.3)	(1vs.3)
Total serum Ca (mg/dl)	8.16±0.34	7.81±0.24	6.854±0.28	0.000	0.000	0.000
Serum ionized Ca (mg/dl)	4.52±0.16	4.52±0.19	4.20±0.19	0.95	0.04	0.04
Serum corrected total Ca (mg/dl)	8.89±0.34	8.02±0.25	7.04±0.31	0.001	0.000	0.000
Serum albumin (g / dl)	3.10±0.23	2.75±0.25	2.13±0.48	0.000	0.000	0.000

Values are given as mean ± SD ; N=number

The mean difference is Significant at the 0.05 level

As seen in(table 2) the same significant reduction in ionized calcium was noticed in the severe preeclampsia group G3 when compared to the healthy pregnant G1, and when compared to mild preeclampsia group G2 ($p<0.05$, $p<0.05$ respectively).but there were no significant difference in ionized serum calcium values between mild preeclampsia group G2 and healthy pregnant group G1 [$p>0.05$] ,serum albumin level showed a decrease in the sera of the mild and severe preeclampsia groups ($p<0.001$, $p<0.001$ respectively) as compared with normal pregnancy group.

The same significant difference in serum albumin levels were noticed between mild and severe preeclampsia groups ($p<0.001$).

Discussion

Women with greater body mass index (BMI) in pregnancy are more likely to become hypertensive than those with a lower BMI[25] so, over weight women are more likely to develop disease that are specific to pregnancy, such as preeclampsia[26] According to these above mention, we found in the present study the mean BMI values in normal healthy pregnant was less than both mild and severe preeclamptic pregnant women.

These findings are also supported by other studies in which pregnant women who subsequently developed preeclampsia, had higher body mass index when compared to healthy pregnant control[27,28,29], elevated BMI is associated with insulin resistance, which is also associated to preeclampsia, but the exact mechanisms is not known, obesity might also act through increased sympathetic activity, this has been associated with hypertensive disorders of pregnancy[30,31] In addition, the regulation of intracellular calcium plays a key role in obesity and hypertension[32].

Deregulations of Ca homeostasis in human may contribute in obesity by the lake calcium influx in human adipocytes, resulting in stimulation of lipogenesis, inhibition of lipolysis and expansion of triglyceride store[33] this obesity, are responsible for the



physiology alterations of vasoactive mediators leading to hypertension during pregnancy[34]thus, in our study has shown that systolic and diastolic blood pressure in maternal preeclamptic women was highly significant as compared with control pregnant,therefore the role played by calcium in the pathogenesis of pregnancy induced hypertension is nowadays receiving growing interest, and the calcium supplementation during pregnancy in reducing hypertensive disorders has been evaluated[35].

In this study, hypertensive subjects had significantly lower levels of serum total Ca as compared to the normotensive($p < 0.001$)(table2), It has been hypothesized that change in the blood pressure due to disturbances in calcium metabolism include increased urinary calcium excretion and abundance of calcium-regulating hormones such as parathyroid hormone(PTH) and calcitriol.

Low calcium levels and elevated PTH and calcitriol may also affect blood pressure control by the central nervous systems by stimulating the release of nor epinephrine (a potent vasoconstrictor) and its post-synaptic effect[36]thus intracellular calcium serves as a second messenger in excitation-contraction coupling for vascular smooth muscle cells, causing constriction and increased blood pressure[37].

Our finding reported here is in agreement with previous studies[38,39,13],in contrary, many investigators like[40,41,42]found that serum calcium in preeclamptic group did not differ significantly from normal pregnant group, this difference which can be attributed to the different dietary habits and the different genetics pools of the population in which the study had been carried out as compared with our population.

The adjustment of serum total calcium concentration for albumin is essential to detect abnormal values and to assess changes in a value[43].

The results demonstrated that the levels of the serum corrected total calcium and serum albumin were highly significant decreased ($p < 0.001$) in the preeclamptic women as compared to that in normal pregnant group.

Our finding are in accordance with those reported by other authors [44,45] ,wherever Gojnic et al,conclude that hypoalbuminemia in preeclampsia is the result of reduced hepatic blood flow which is secondary to hypovolemia created by higher filtration pressure in the capillaries[46] and propose the serum albumin level may serve as indicator of the severity of preeclampsia. However our findings was disagree with investigators found that serum albumin level was higher in preeclampsia group[47,48], this contrast may be caused from the mislead between underlying chronic hypertension or renal disease during pregnancy and preeclampsia condition.

Regarding the ionized fraction of calcium which is crucial for the synthesis of vasoactive substance in the endothelium[49].the finding of significant reduction in this fraction, as seen in (table2) is consistent with those reported by Seely et al[50]who confirmed that preeclamptic pregnant women had significantly lower 1,25-dihydroxy vitamin D[1,25-(OH)₂D] levels, Thus lower 1,25-(OH)₂D levels may contribute to the suboptimal intestinal absorption of calcium during a time of increased calcium demand, thus resulting is lower ionized calcium levels, increased PTH and hypocalciuria in preeclampsia.

Our study coincided with other studies (51,52) reported difference in ionized calcium between normal and preeclamptic groups.

On the other hand, physiologically important changes in ionized calcium can be produced without change in the total Ca concentration, by altering the affinity of albumin for calcium, two factors affect on change the amount of calcium bound, the PTH and extra cellular pH[53].



As a results, present study (table2) exhibited that the changes occurred in the total calcium concentration don't correspondence with the changes in ionized calcium levels within preeclampsia groups, Accordingly in our study there were no significant difference ($p > 0.05$) in serum ionized calcium concentration between mild preeclamptic and healthy pregnant women, our findings indicate adjusted blood pH as is sometimes done for ionized calcium results[54],to avoid any confusion that may occurs during test.

Conclusion

From theoretical and clinical points of view, we conclude from our study that reduction in maternal serum total calcium with consequent an ionized calcium as a fraction of total calcium, may have role in pregnant women in subjects to this disorder, as well as development of preeclampsia.

In addition, to have better understanding of calcium homeostasis in preeclamptic women, not just need to measure total and ionized calcium, and serum albumin, but similarly to get a better understanding of vitamins related disorder. As a result of that we needed other studies that confirm whether the supplementation of this mineral and other vitamins has favorable or adverse effects on fetal and neonatal outcomes as well as maternal outcomes.

Reference

- 1-Sarsam- DS, Shmden- M and ALwazan- R. Expectant versus aggressive management in severe preeclampsia remote from term. Singapore Med J , 2008;149:698.
- 2-Solmon- CG and Seely- EW. preeclampsia. Searching for the cause. Engel J Med, 2004;350:641-2.
- 3-Roberts- JM, Taylor - RN, Musci - TJ, Rodgers- GM et al. Preeclampsia; an endothelial cell disorder. Am J Obstet Gynecol, 1981; 161:1200-4.
- 4-Baker- PN. (ED). Obstetrics by ten Teacher; 18th edition. 2006, pp:159-161. Hodder Arnold
- 5-Maryland-B. Report of the National high Blood pressure Education program Working group on High blood pressure in pregnancy. Am J Obstet Gynecol, 2000;183:S1-S22
- 6-Hypertention in pregnancy (the management of hypertensive disorders during pregnancy NICE clinical guideline 107, issued: august 2010 last modified: January. 2011. National Institute for health and clinical excellence.
- 7-Hofmeyr- GJ, Duley- L and Atallah- A. Dietary calcium Supplementation for prevention of preeclampsia and related problems: a systematic review and commentary Jog, 2007;114(8):933-943.
- 8-Ortega- RM, Martinez- RM, et al. Influence of calcium intake on gestational hypertension. Ann Nutr Metab, 1999;43 (1):37-46.



9-Coughey- AB ,Stotland- NE,Washington- AE,Escobar- GJ.Maternal ethnicity, paternal ethnicity, and parental ethnic discordance: predictors of preeclampsia.Obstet Gynecol, 2005;106:156-61.

10-Bongard- FS,Sue- DY,and Vintch- JR.Current diagnosis and treatment, critical care(3rd ed)2008.Newyork:McGraw-Hill/lange,p.51.

11-Rajarman- S,SeLvanayagam -S,Chidambaram- R.Correlation study between total calcium, ionized calcium, serum albumin and their significance with vitamin D.Journal of Experimental sciences, 2011;2(12):17-21.

12-Jones and Bartlett learning,LLC.Not for SALE or Distribution.chapter6,calcium Imbalances.

13-Dunthumapol- C,Kittichot- PB.Serum calcium,maganesium and uric acid in preeclampsia and normal pregnancy. Med assoc Thai, 2008;91:968-73.

14-Belizan- JM and Villar- J.The Relation between Ca intake and edema,proteinuria,and hypertension gestosis:An hypothesis. Am J Clin Nutr ,1980;33:2202-10.

15-Moore- EW.Ionized calcium in normal serum, ultrafiltrates,and whole blood determined by ion-exchange electrodes. Clin Invest,1970;49:318-34

16-Payne- RB,Little- AJ,Williams- RB and Miller- JR.Interpretation of serum ca in patients with abnormal serum proteins.Brit.Med.J, 1973;4:643-646.

17-Suryono - DW,Wirakusumah- Ff and Anwar- AD. The correlation between calcium serum and calcium urine level with the blood pressure in preeclampsia. Maj Obstet Ginekol Indones,2012;36-1:3-7.

18-Chobanian- AV,Bakris- GL,Black- HR,Cushman –WS,etal.Seventh report of the joint national committee on prevention,detection,evaluation,and treatment of high blood pressure. Hypertension, 2003.DC; 1;42:1206-52.

19-Willett-WC,Dietz- WH and Colditz- GA.Guidelines for healthy weight.N.Eng.J.Med,1999;341:427

20-Endres- DB and Rude- RK.Mineral and Bone Metabolism In:Carel-AB,and Edward-RA.(Eds).Tietz Textbook of clinical chemistry.3rd ed.1999;pp:1395-1412.Saunders Company, Philadelphia.

21-Gindler- EM,King -JD.Rapid colorimetric determination of calcium in biologic fluid with methyl thymol blue.Am.J.Clin.Path,1972; 58(4):376-382.

22-Determination of serum albumin:Doumas -BT and Biggs- HG. Standard Methods of clinical chemistry-Acad press.N.Y,1972; 7:175-188.

23-Sava-L,Pillai-S,More-U,Sontakke-A. Serum calcium measurement: total versus free(ionized)calcium. Indian Journal of clinical Biochemistry,2005;20(2):158-161.



24-carl- AB and Edward- RA.Tietz text book of clinical chemistry.W.B.saunders(Ed 3rd)1999,1400.

25-Pipkin-FB.Risk factors for preeclampsia.N Engl J Med, 2001;344:925-6.

26-Weiss-JL,Malone-FD,Emig-D, etal.Obesity,obstetric complications and cesarean delivery rate-a population-based screening stud. Am J Obstetric Gynecol,2004;190:1091-1097.

27-Obrien-TE,Ray-JG and Chan-WS.Maternal body mass index and the risk of preeclampsia:asystematic overview epidememiology,2003 may;14(3):368-74.

27-Vahiroodsari-F,etal.The effect of prepregnancy body mass index on the development of gestational hypertension and preeclampsia.J Babol Univ Med Sci,2009;11(4).

28-Ana-BZ.Obesity and oxidative stress: direct link to preeclampsia?Arch Gynecol Obstet ,2011;283:415-422.

29-Weidman-P,etal.The pathogenesis of hypertension in obese subjects.Drugs,1993;46(suppl2):197-208.

30-Schobel-HP,etal.Preeclampsia –a state of sympathetic overactivity.N Eng J Med,1997;335:1480-5.

31-Zemel-MB.Calcium modulation of hypertension and obesity: mechanisms and implications. Journal of the American college of nutrition,2001;20(5):428S-435S.

32-Must-A,Spadano-J,Coakley-EH,etal.The disease burned associated with overweight and obesity.JAMA,1999;282:1523-1529.

33-Murai-JT,Muzykanskiy-E and Taylor-RN.Maternal and fetal modulators of lipids metabolism correlate with the development of preeclampsia.Metabolism,1997;46:963-7.

34-Imdad-A,etal.Role of calcium supplementation during pregnancy in reducing risk of developing gestational hypertensive disorders:ameta-analysis of studies from developing countries:BMC Public Health, 2011;11(Suppl3):S18

35-Martinez-C.Calcium and hypertension. Nutrition Bytes,1998;4(2).

36-Oshima-T and Young-EW.Systemic and cellular calcium metabolism and hypertension. Seminars in Nephrology,1995 Nov;15(6):496-503.

37-Jain-S,etal.The role of calcium,magnesium,and zinc in preeclampsia.Biol Trace Elem Res,2010;133:162-70.

38-Kim-J,etal.Serum levels of zinc,calium,and iron are associated with the risk of preeclampsia in pregnant women. Nutrition Research. Elsevier Inc,2012;32(764-769).



- 39-Punthumapol-C and Kittichotpanich-B. Serum calcium, magnesium and uric acid in preeclampsia and normal pregnancy. *Med Assoc Thai*, 2008;91:968-73.
- 40-Fatemeh-VR, et al. Serum calcium and magnesium in preeclamptic and normal pregnancies, comparative stud. *Reports Infertil*, 2008;9(3):256-262.
- 41-Bera-S, Siuli-RA, et al. Study of serum electrolytes in pregnancy induced hypertension. *Indian Med Assoc*, 2011 Aug;109(8):546-8.
- 42-Salari-MD and Eftekhari-MD. The comparison of total and ionized serum calcium in preeclamptic pregnant women and the women with normal pregnancy. *Journal of Rafsanjani University of Medical sciences and Health Services*, 2005;4(2):123-128.
- 43-Payne-RB, Margaret-EC and Morgan-DB. Interpretation of serum total calcium: effect of adjustment for albumin concentration on frequency of abnormal values and on detection of change in the individual. *Journal of Clinical Pathology*, 1979;32:56-60.
- 44-Seong-WJ, et al. Clinical significance of serum albumin level in pregnancy-related hypertension. *Obstetric Gynecology Res*, 2010 Des;36(6):1165-73.
- 45-Alavi-A, Jahanshahi-KA, et al. Comparison of serum calcium, total protein and uric acid levels between hypertensive and healthy pregnant women in Iranian population. *Life Science Journal*, 2012;9(4).
- 46-Gojnic-M, et al. Plasma albumin levels as an indicator of severity of preeclampsia. *Clin Exp Obstet Gynecol*, 2004;31(3):209-10.
- 47-Salako-BL, et al. Serum albumin, creatinine, uric acid and hypertensive disorders of pregnancy. *East African Medical Journal*, 2003 august;80(8).
- 48-Salari-Z, Eftekhari-N and Tajaddini-M. The comparison of total protein, albumin and phosphorous level in preeclamptic pregnant women and women with normal pregnancy. *Journal of Kerman University of Medical Sciences*, 2006;13(4).
- 49-Lopez-P. Prevention of preeclampsia with calcium supplementation and its relation with the L-arginine nitric oxide pathway. *Braz J Med Biol Res (BRAZIL)*, 1996;29:731-41.
- 50-Seely-EW, et al. Lower serum ionized calcium and abnormal calciotropic hormone levels in preeclampsia. *J Clin Endocrinol Metab*, 1992 Jun;74(6):1436-40.
- 51-McCarron-DA. Low serum concentration ionized calcium in patients with hypertension. *Engl J Med*, 1982 Jul 22;307:226-8.
- 52-Pawad-YR, et al. Calcium: Can it be a diagnostic and prognostic marker in essential hypertension? *Journal of Clinical and diagnostic Research*, 2011 Feb;5(1):58-62.
- 53-Oberleithner-H, Greger-R, and Lauge-F. The effect of respiratory and metabolic acid-base changes on ionized Ca concentration. *Eur J Clin Invest*, 1982;12:451.

54-Wang-S,Mcdonnell-EH,etal.Ph effects on measurements of ionized calcium and ionized magnesium in blood. Arch Path Lab Med,2002;1126

مستوى الكالسيوم وبعض المؤشرات الفسلجية خلال مرض قبل الشنج والحمل الطبيعي في نساء محافظة بابل

1- نوران جميل إبراهيم2- داليا شاكر عبيد

1-قسم علوم الحياة-كلية العلوم للبنات -جامعة بابل2-مستشفى بابل للولادة والأطفال-مختبر الكيمياء الحياتية

الخلاصة

يعد مرض قبل الشنج اضطراب ضغط الدم المرتبط بالحمل خلال الفصل الثاني منه، وافترضت العديد من الدراسات إن معدن الكالسيوم يلعب دور مهم في أمراضه.

انتقيت 115 امرأة حامل دخلت إلى مستشفى بابل للولادة والأطفال للفترة بين شباط 2012 - كانون الأول وتراوح أعمارهن بين (20-40) سنة وتراوح عمر الحمل بين (29-39) أسبوع، وتضمنت المجموعة 50 امرأة حامل سليمة والتي عدت مجموعة سيطرة وشخصت 35 حامل مصابة بمرض قبل الشنج نوع الحاد و30 حامل مصابة بمرض قبل الشنج نوع المتوسط وتم تحليل مصل أولئك النساء (المريضات والسيطرة) وقيم كالسيوم المصل الكلي والكالسيوم الكلي المصحح والكالسيوم الحر أو المتأين والألبومين، كما تم جمع قيم مؤشر كتلة الجسم وضغط الدم الانبساطي والانقباضي وتم تحليل النتائج باستعمال النظام الإحصائي (SPSS) والمقارنة بين نتائج المجاميع قيد الدراسة.

أظهرت النتائج زيادة معنوية ($p < 0.001$) في قيم مؤشر كتلة الجسم وضغط الدم في النساء المصابات بمرض قبل الشنج في طوريه (الحاد والمتوسط) بالمقارنة مع النساء ذوات الحمل الطبيعي، كما أظهرت النتائج وجود نقصان معنوي في مستوى الكالسيوم الكلي والكالسيوم المصحح والألبومين في النساء المصابات بمرض قبل الشنج ($p < 0.001$) ($p < 0.05$) بالمقارنة مع العوامل السليمة، في حين أظهرت النتائج نقصان غير معنوي ($p > 0.05$) في مستوى الكالسيوم المتأين في النساء المصابات بمرض قبل الشنج المتوسط مقارنة بمجموعة السيطرة، في حين كان الانخفاض في تركيز الكالسيوم المتأين معنوي ($p < 0.05$) في مجموعة مرض قبل الشنج الحاد مقارنة مع النساء في مجموعة السيطرة.

وقد نستنتج من نتائج بحثنا هذا بان إجراء تلك الفحوصات الكيموحيوية والفسلجية متأخرة إثناء الحمل قد تجعل تلك القيم تملك دور قليل لتنبأ حدوث مرض قبل الشنج الذي يمكن أن يكون قد تطور ووصل مراحل متأخرة، لذا توصي دراستنا بضرورة إجراء تلك الفحوصات مبكراً إثناء الحمل، كما و يجب أن يدرس مستقبلاً بعق الدور الذي تلعبه نقص بعض الفيتامينات في حدوث هذا المرض.