Comparative Study between Serum Calcium and Magnesium Levels in Pre-eclampsia Versus Normal Pregnancy

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Abstract

Background: Numerous clinical studies had clarified the alliance between preeclampsia and disturbances in maternal biochemical macronutrients, involving serum calcium (Ca\(^{+2}\)) and magnesium (Mg\(^{+2}\)). Up till now, there is an escalated concern in benefitting from nutritional approach in the preecclampsia management with respect to calcium and magnesium supplementation.

Aim of Study: To assess serum levels of calcium and magnesium in pregnant females who suffered from pre-eclampsia in comparison with normal pregnant ladies.

Patients and Methods: This study was a case-control one that recruited 100 pregnant women (50 pregnant preeclampsia cases and 50 normal pregnant females) from obstetrics clinics of Damanhour General hospital, and El-Sayed Galal Hospital of Al-Azhar University after the 20th week of gestation during the period of research from February 2020 to December 2020 for estimation off serum calcium and magnesium.

Results: The mean serum calcium level in the control group was 8.99\(\pm\)0.52mg/dl, and mean serum magnesium level was 2.21\(\pm\)0.3mg/dl. Both were higher than those in the patients group as the mean serum Ca\(^{+2}\) was 8.05\(\pm\)0.51mg/dl and mean serum Mg\(^{+2}\) level was 1.86\(\pm\)0.25mg/dl (\(p<0.001\)). Calcium had significantly higher diagnostic accuracy than magnesium to differentiate normotensive pregnant women from preeclamptic pregnant women. ROC curve showed that the optimum cut off for calcium was 8.55 (mg/dL) with sensitivity of 80%, specificity of 84%, PPV of 83.3%, and NPV of 80.8%. Calcium had largest area under the curve (AUC=0.898; CI: (0.840-0.956) (\(p<0.001\)), indicating its importance for predicting preeclampsia. While the cut off value of magnesium was less than 2.15 (mg/dL), the sensitivity was 88%, specificity was 60%; an area under the ROC curve (AUROC) 0.806 (95% CI: 0.721-0.891). In addition, ROC curve showed the optimum cutoff for serum calcium was 8.15 (mg/dL) for predicting adverse outcome of pregnancy with sensitivity 60.6%, specificity 86.6%; and an area under the ROC curve (AUROC) 0.792 (95% CI: 0.701-0.883). While the cut off value of serum magnesium was less than 1.945 (mg/dL), the sensitivity was 69.7%, specificity was 67.2%; an area under the ROC curve (AUROC) 0.726 (95% CI: 0.618-0.834).

Conclusion: Both serum calcium and serum magnesium in preeclamptic pregnant women were lesser in comparison to their healthy pregnant counterparts. These outcomes supported the postulation that there is a cause-consequence liaison between hypocalcaemia and hypomagnesaemia as potential etiologic factors incriminated in of preeclampsia pathogenesis.

Key Words: Preeclampsia – Calcium – Magnesium.

Introduction

PREECLAMPSIA, tagged as a syndrome of theories, is a recognized health challenge with devastating foeto-maternal consequences. It has been with numerous postulations suggested to unravel its aetiopathogenesis [1].

It is a multisystem disorder that affects 2-8% of pregnant females, and it is a profound complication of pregnancy characterized by new onset of hypertension with significant proteinuria after 20 weeks’ gestation [2].

It is the third most common cause of maternal death worldwide. Developing countries are more adversely affected as 20-80% of increased maternal mortality is associated with pre-eclampsia [3].

Since the pathogenesis of preeclampsia has not been fully elucidated, the search for predictive markers and preventive strategies remains an unfulfilled issue [4].

Even though a multitude of novel for example; serum placental growth factor (PIGF), soluble fms-like tyrosine kinase 1, and soluble endoglin have been determined to aid as initial predictors of preeclampsia. Also, serum calcium and magnesium may be applicable and cost-effective predictors for preeclampsia since the beginning of pregnancy [5].

Deficiencies in mineral constituents as calcium, magnesium, zinc, etc., have been documented to
Numerous clinical studies have focused on the pathogenesis of preeclampsia has been highlighted.

It has been hypothesized that oscillations in maternal serum ions may be the instigating cause of elevated blood pressures in preeclampsia. Dietary deficiency of mineral ions has been displayed to have a deleterious effect on the both maternal and fetal health and may be possibly complicated by preeclampsia [7].

Once more, nutritional deficiency role in the pathogenesis of preeclampsia has been highlighted. Numerous clinical studies have focused on the association between preeclampsia and deficiencies in maternal biochemical macronutrients, comprising calcium and magnesium with an increasing concern in the management of preeclampsia via nutritional approach especially calcium and magnesium supplementation [8].

This study aimed to assess serum levels of calcium and magnesium in pregnant females who suffered from pre-eclampsia in comparison with normal pregnant ladies.

**Patients and Methods**

This study was a case-control one that recruited 100 pregnant women (50 pregnant preeclampsia cases and 50 normal pregnant females) from obstetrics clinics of Kafr El-Sheikh General Hospital and El-Sayed Galal Hospital of Al-Azhar University after the 20th week of gestation during the period of research from February 2020 to December 2020 for estimation of serum calcium and magnesium. Inclusion criteria were maternal age between 15-45 years, gestational age after the 20th week of gestation. Preeclampsia cases were diagnosed according to the American College of Obstetrics and Gynecology (ACOG) with systolic blood pressure ≥140mm Hg and or diastolic blood pressure ≥90mm Hg after 20th week of gestation on two occasions each 6 hours apart [9]. Whitten consents were obtained from the patients.

Exclusion criteria: Maternal systemic disorder; chronic hypertension, diabetes mellitus, chronic kidney disease(CKD), ischemic heart disease (IHD), history of immunosuppression intake, history of previous poor pregnancy outcomes (intrauterine growth retardation, recurrent abortions), history of smoking, any disease recognized to disturb serum calcium or magnesium e.g renal disease, known digestive disorders or, known thyroid or adrenal disease, eating disorders, antenatal vitamin or mineral supplementation.

The elected patients were subjected to detailed history taking complete general, abdominal examination and ultrasonographic examination. Then, about 5ml of venous blood was collected once from both study group and control group by antecubital vein-puncture, using a sterile disposable syringe, without using elastic band tourniquet half of the amount collected were transferred immediately into commercially prepared concentration of Ethylene Di-amine Tetra-acetic Acid (EDTA) containers. The remaining half was allowed to clot and the serum was obtained by centrifugation at 3000 rpm for 10 minutes or the remaining investigations including serum calcium, magnesium concentrations estimation using Atomic Absorption Spectrophotometer.

**Statistical analysis:**

Statistical analyses of data were carried out using SPSS version 23. Shapiro-Wilks test was used to test normal distribution of variables. Numerical data were expressed as mean ± standard deviation or median and range. Categorical data were summarized as percentages. The significance for the difference between groups was determined by using two-tailed Student’s t-test. Also Qualitative variables were assessed by chi-squared χ² test. The probability (p) values of ≤0.05 were considered statistically significant indicated. The Receiver Operating Characteristic (ROC) was constructed to obtain the most sensitive and specific cutoff value for serum Ca²⁺ and Mg²⁺. Mann whitney test was used to compare data that were not normally distributed.

**Results**

Overall, 100 pregnant women were recruited in this study during the period of research from February 2020 to December 2020 to Obstetrics Clinic of Damanhour General Hospital and El-Sayed Galal Hospital of Al-Azhar University. All eligible cases were recruited after the 20th week of gestation. They were divided into 2 groups: 50 controls and 50 pregnant women who developed preeclampsia with systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90mmHg after 20th week of gestation on two occasions each 6 hours apart. The mean age of patients group was 29.92±7 years while it was 29.72±4.51 years in control group. There were no statistically significant differences in the mean age of both studied groups (p=0.866). Also, these results indicated that there
was no statistically significant difference between all studied groups according to body mass index, gravidity, and parity (p>0.05).

Additionally, there was a significant difference between the two studied groups with regards to blood pressure both systolic and diastolic which increased with the occurrence of preeclampsia (p<0.001). The results showed that the average systolic blood pressure among cases was found to be 159.8mmHg compared with 113.6mmHg among controls. Furthermore, average diastolic blood pressure was found to be 103.12mmHg among preeclampsia cases compared with 70.8mmHg among controls.

In preeclampsia group, thirty-four (68%) delivered by cesarean section whereas sixteen cases delivered vaginal (32%). A significantly higher occurrence of Cesarean section in the preeclamptic group than in the control group (p=0.026). Also, there was a significant difference between the two studied groups with regards to appearance of protein in urine which increased in patients with preeclampsia (p<0.001). All control cases hadn’t have proteinuria whereas, in preeclampsia group, Sixteen (32%) of the cases showed proteinuria level ranged from (+1 - +2), whereas 34 (68%) of them showed a level ranged from (+3-+4).

It was observed that, in preeclampsia cases, the mean gestational age at delivery was significantly lower than that in the controls (33.58±3.82 vs 36.94±2.21, p<0.001). Furthermore, patients with preeclampsia had significantly lower mean birth weights for the neonates compared to controls (1671.4±670.8g vs 3297±339.2g (p<0.001). Among the control group, all babies were of weight more than 2.5kg, whereas 72% of newborns to preeclampsia mothers had weight less than 2kg, 26% were of weight 2-2.5kg and remaining babies (2%) were more than 2.5kg weight (Table 1).

Among the study group, 44% had Intra Uterine Growth Retardation (IUGR) babies, 6% had intrauterine fetal death (IUFD), 10% developed eclampsia and 2% developed HELLP syndrome. Among the control group, 8% has IUGR babies, 8% had PPROME, and 2% had Intra Uterine death (Table 1).

The results showed that there was statistically significant decrease in the hemoglobin levels platelets count as well as leucocytes count among cases with preeclampsia compared to that of controls (12.14±1.2 (g/dL) vs. 12.63±1.3 (g/dL); p=0.05) & (219.337±74.56 (x10^3 / µL); vs. 276.72±52.88 (x10^3 / µL; p<0.001) and (8536.5±3118.3/ µL; vs. 11542.8±2357/ µL; p<0.001). While, there was no significant difference in the mean value of RBCs between studied groups (p>0.05) (Table 1).

The current study also showed that the mean serum albumin level was not significantly different in control cases (3.46±0.3) (g/dL) compared to that detected among patients (3.34±0.4) (g/dL); (p=0.92).

Regarding calcium and magnesium levels, the results showed progressively increase in the mean serum calcium and magnesium levels in control cases compared to PE cases (8.99±0.52mg/dL vs. 8.05±0.51mg/dL) and (2.21±0.3mg/dl vs. 1.86±0.25mg/dL) respectively. The present study showed that the mean serum calcium and magnesium level in the study group who developed preeclampsia were lower than the control group who remained normotensive (p<0.001), which is statistically significant (Table 1).

The present study showed that calcium had significantly higher diagnostic accuracy than magnesium for differentiate normotensive pregnant women from preeclamptic pregnant women. ROC curve showed that the optimum cut off for calcium was 8.55 (mg/dL) with sensitivity of 80% and specificity of 84%, PPV of 83.3 %, NPV of 80.8%. Calcium has largest area under the curve (AUC=0.898; CI: (0.840-0.956) (p<0.001), indicating its importance for predicting preeclampsia (Table 3 and Fig. 1). While the cut off value of magnesium was less than 2.15 (mg/dL), the sensitivity was 88%, specificity was 60%; an area under the ROC curve (AUROC) 0.806 (95% CI: 0.721-0.891).

Table (4) and Fig. (2) illustrated the ROC plots to assess the diagnostic efficiency of serum calcium and magnesium for predicting poor outcome of pregnancy. ROC curve analysis showed that calcium had significantly higher diagnostic accuracy than magnesium in predicting outcome of pregnancy.

ROC curve showed the optimum cutoff for serum calcium was 8.15 (mg/dL) for predicting adverse outcome of pregnancy with sensitivity 60.6% and specificity 86.6%; an area under the ROC curve (AUROC) 0.792 (95% CI: 0.701-0.883). While the cut off value of serum magnesium was less than 1.945 (mg/dL), the sensitivity was 69.7%, specificity was 67.2%; an area under the ROC curve (AUROC) 0.726 (95% CI: 0.618-0.834).
**Table (1):** Demographic data and biochemical parameters of the patients and controls.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Preeclampsia Group (n=50)</th>
<th>Healthy Controls (n=50)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Yrs.)</td>
<td>29.92±7</td>
<td>29.72±4.51</td>
<td>0.866</td>
</tr>
<tr>
<td>BMI at enrollment</td>
<td>27.97±6.8</td>
<td>27.38±3.3</td>
<td>0.577</td>
</tr>
<tr>
<td>Gravidity</td>
<td>2.78±1.48</td>
<td>2.7±1.66</td>
<td>0.8</td>
</tr>
<tr>
<td>Parity</td>
<td>0.28±0.57</td>
<td>0.26±0.44</td>
<td>0.846</td>
</tr>
<tr>
<td>Systolic Blood Pressure (mmHg)</td>
<td>159.8±20.25</td>
<td>113.6±9.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diastolic Blood Pressure (mmHg)</td>
<td>103.12±11.6</td>
<td>70.8±6.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Gestational age at delivery (weeks)</td>
<td>33.38±3.82</td>
<td>36.94±2.21</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Mode of delivery:**
- Vaginal: 16 (32%) vs. 28 (56%) 0.026
- Cesarean section: 34 (68%) vs. 22 (44%)

**Appearance of proteinuria:**
- None: 0 (0%) vs. 50 (100%) 0.001
- 1-2: 16 (32%) vs. 0 (0%)
- 3-4: 34 (68%) vs. 0 (0%)

**Birth weight [g]**
- 1671.4±670.8 vs. 3297±339.2 <0.001

**Complications:**
- None: 25 (50%) vs. 45 (90%) <0.001
- IUGR: 22 (44%) vs. 4 (8%)
- PPROM: 0 (0%) vs. 0 (0%)
- HELLP: 1 (2%) vs. 0 (0%)
- Eclampsia: 5 (10%) vs. 0 (0%)
- IUFD: 3 (6%) vs. 1 (2%)

**Hemoglobin (g/dL)**
- 12.14±1.2 vs. 12.63±1.3 0.053

**RBCs count (x10^6/µL)**
- 4.02±0.645 vs. 4.08±0.319 0.586

**Leukocytes count (/µL)**
- 8536.5±3118.3 vs. 11542.8±2357 0.001

**PLT (x10^3/µL)**
- 219.337±49.8 vs. 276.72±147.7 0.001

**Serum Calcium (mg/dL)**
- 8.05±0.51 vs. 8.99±0.52 <0.001

**Serum Magnesium (mg/dL)**
- 1.86±0.25 vs. 2.21±0.3 <0.001

Values are expressed as mean ± standard deviation or n (%) unless otherwise specified.
BMI: Body mass index. PLT: Platelets
Mann whitney test was used to compare groups regarding gravidity, parity, leucocytes, RBSs, and platelets because cases were not normally distributed.

**Table (2):** Correlation of serum calcium and magnesium levels and other parameters of all studied cases.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Calcium (mg/dl) r</th>
<th>p-value</th>
<th>Magnesium (mg/dl) r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.027</td>
<td>0.790</td>
<td>-0.054</td>
<td>0.596</td>
</tr>
<tr>
<td>Gestational age</td>
<td>0.374</td>
<td>0.001***</td>
<td>0.192</td>
<td>0.056</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.610</td>
<td>&lt;0.001***</td>
<td>0.419</td>
<td>0.001***</td>
</tr>
<tr>
<td>Gravidity</td>
<td>0.052</td>
<td>0.606</td>
<td>0.00</td>
<td>0.997</td>
</tr>
<tr>
<td>Parity</td>
<td>-0.045</td>
<td>0.659</td>
<td>-0.08</td>
<td>0.430</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>0.015</td>
<td>0.881</td>
<td>0.059</td>
<td>0.561</td>
</tr>
<tr>
<td>Route of delivery</td>
<td>-0.172</td>
<td>0.086</td>
<td>0.061</td>
<td>0.544</td>
</tr>
<tr>
<td>Systolic Blood pressure</td>
<td>-0.629</td>
<td>&lt;0.001***</td>
<td>-0.554</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>Diastolic Blood Pressure</td>
<td>-0.653</td>
<td>&lt;0.001***</td>
<td>-0.553</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>Albumin</td>
<td>0.029</td>
<td>0.776</td>
<td>0.157</td>
<td>0.118</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>-0.652</td>
<td>&lt;0.001***</td>
<td>0.482</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>0.160</td>
<td>0.112</td>
<td>0.106</td>
<td>0.295</td>
</tr>
<tr>
<td>WBCs</td>
<td>-0.327</td>
<td>0.001***</td>
<td>-0.184</td>
<td>0.067</td>
</tr>
<tr>
<td>Platelet count</td>
<td>0.383</td>
<td>&lt;0.001***</td>
<td>0.278</td>
<td>0.001***</td>
</tr>
<tr>
<td>RBCs</td>
<td>-0.056</td>
<td>0.580</td>
<td>-0.042</td>
<td>0.676</td>
</tr>
<tr>
<td>Fetal complications</td>
<td>-0.426</td>
<td>&lt;0.001***</td>
<td>-0.288</td>
<td>0.004***</td>
</tr>
<tr>
<td>Maternal complications</td>
<td>-0.159</td>
<td>0.114</td>
<td>-0.212</td>
<td>0.034*</td>
</tr>
</tbody>
</table>
Table (3): Diagnostic values of serum calcium and magnesium for differentiate normotensive pregnant women from preeclamptic pregnant women.

<table>
<thead>
<tr>
<th></th>
<th>Cutoff</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (mg/dL)</td>
<td>8.55</td>
<td>80%</td>
<td>84%</td>
<td>83.3%</td>
<td>80.8%</td>
</tr>
<tr>
<td>Magnesium (mg/dL)</td>
<td>2.15</td>
<td>88%</td>
<td>60%</td>
<td>68%</td>
<td>83.3%</td>
</tr>
</tbody>
</table>

ROC Curve

Fig. (1): ROC curve of serum calcium and magnesium for discriminating normotensive pregnant women from preeclamptic pregnant women.

Table (4): Diagnostic values of serum calcium and magnesium for predicting outcome of pregnancy.

<table>
<thead>
<tr>
<th></th>
<th>Cutoff</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium (mg/dL)</td>
<td>8.15</td>
<td>60.6%</td>
<td>86.6%</td>
<td>69%</td>
<td>81.7%</td>
</tr>
<tr>
<td>Magnesium (mg/dL)</td>
<td>1.945</td>
<td>69.7%</td>
<td>67.2%</td>
<td>51.1%</td>
<td>81.8%</td>
</tr>
</tbody>
</table>

ROC Curve

Fig. (2): ROC curve of serum calcium and magnesium (mg/dL) for predicting outcome of pregnancy.

Discussion

Regarding serum calcium and magnesium, the mean serum calcium and magnesium levels in the control group were higher than those in the patients group.

The present study demonstrated that serum calcium was positively correlated with gestational age, birth weight, and platelets count. However, it was negatively correlated systolic blood pressure, diastolic blood pressure, proteinuria, WBCs, and fetal complications. On the other hand, serum magnesium was positively correlated with birth weight, and platelets count, whereas it was negatively correlated systolic blood pressure, diastolic blood pressure, proteinuria, fetal complications, and maternal complications.

The present study showed that calcium had significantly higher diagnostic accuracy than magnesium for differentiate normotensive pregnant women from preeclamptic pregnant women. Calcium has largest area under the curve, indicating its importance for predicting preeclampsia.

In addition, ROC curve showed the optimum cutoff for serum calcium and magnesium for predicting adverse outcome of pregnancy.

Calcium plays a crucial part in the function of the vascular smooth muscles. Variation of plasma calcium concentration leads to elevated blood pressure. Moreover, magnesium acts as co-factor for several enzymes and is involved in peripheral vasodilatation. A number of studies displayed that blood calcium and magnesium have a relaxant influence on the blood vessels of pregnant women [10].

The findings of lower levels of serum calcium and magnesium in women with pre-eclampsia is in tandem with previous studies Kanagal et al., [11]; Onyegbule et al., [12]; Olusanya et al., [13]; Ugwuja et al., [8]; Aslam et al., [5] and Okoror et al., [14]. The tendency for occurrence of maternal hypocalcemia during pregnancy has been authenticated for decades. Over the pregnancy course, total calcium tends to diminute and more significant decrease ids reported in pre-eclampsia [15].

Changes in serum calcium levels are concomitant with blood pressure alteration. During the third trimester, around 200mg of calcium per day is deposited in the fetal skeleton via the placenta pregnancy and thru this period, maternal excretion of the urinary calcium is doubled. Diminutions in serum calcium level provotes the release of rennin
and parathyroid hormones that trigger increase in the intracellular calcium concentration in vascular smooth muscle cells. This stimulates vasoconstriction as well as increased peripheral vascular resistance, augmenting the raised blood pressure. Consequently, aberrations in calcium homeostasis may make a contribution to the abnormal vasculopathy that has been already established in preeclampsia [16].

In agreement to our results, Tavana and Hosseinmirzazai [6] found that serum magnesium in pre-eclampsia cases was significantly less than the control group that consisted of normal pregnant women.

Furthermore, multitude of research works have reported a decrease in serum magnesium levels as a probable etiology of preeclampsia Jain et al., [17]; Roberts et al., [18]; Akinloye et al., [19] and Ugwuja et al., [8]. This evidence is reinforced by the effectiveness of magnesium sulfate therapy for prophylaxis and treatment of preeclampsia / eclampsia allied seizures [7].

Magnesium, a fundamental intracellular cation, contributes to neurotransmission and peripheral vasodilation. At the sub-cellular level, magnesium acts as an indispensable cofactor in the ATPase activation thus controlling metabolic regulation of energy-dependent cytoplasmic and mitochondrial pathways and regulating oxidative-phosphorylation processes. Moreover, it controls contractile proteins, modulates transmembrane transport of ions like calcium, sodium, and potassium, and influences DNA and protein synthesis [8].

In accordance to our results, novel work conducted by Okoror et al. [14] reported a statistically significant elevation in the prevalence of hypocalcemia among pre-eclampsia cases contrasted to the controls. A potential justification for this finding is the elevated intracellular calcium that ensues after low serum calcium with resultant vasoconstriction and elevated blood pressure [20].

Okoror et al. [14] found also a negative correlation between serum calcium and blood pressure and positive correlation between serum magnesium and calcium in their study.

There are no well-established policies for the preeclampsia prevention. Particular studies have shown that dietary calcium supplementation seemed to be applicable in downgrading the risk of preeclampsia occurrence [16].

A meta-analysis done in the developing country shows that dietary calcium supplementation seemed to take 1 to 1.5gms of calcium daily for pre-eclamptic complication prevention. Milk, milk, yogurt, cheese and vegetables like cabbage, broccoli, almonds, sardine and salmon with bones and calcium fortified orange juice are good sources of calcium. The daily requirement of magnesium is about 350mg/day. Foods rich in magnesium include whole grains, nuts and green vegetables. Green leafy vegetables are particularly good sources of magnesium. The limitation of our study was that a detailed dietary assessment of the subjects was not done. Pregnant women in developing countries should be encouraged to consume food rich in calcium and magnesium. If the intake is less than the recommended dose, a supplement can be given [11].

Nonetheless, Chukwunyere et al. [23] in contrary to the current work, showed non-significant difference between the mean serum calcium level in normotensive pregnant women, gestational hypertension, and PE.

Darkwa et al. [7] also observed no statistically significant dissimilarity in mean entire serum calcium and magnesium levels of pre-eclamptic females when paralleled to normal pregnant women, and they mentioned that hypomagnesemia and hypocalcemia as etiopathologic factors in the development of preeclampsia are not a universal finding in literature. Numerous research work from different regions across the globe have reported varying results concerning the role of these trace elements in the etio-pathogenesis of preeclampsia [17,19,24].

Golmohammad Lou et al. [25] have disputed about the role of calcium and trace elements in high blood pressure, particularly, pre-eclampsia. They explicated that, although slightly lesser, there was no significant discrepancy was found in calcium and magnesium concentrations between women with pre-eclampsia and their normal healthy counterparts.

This however, is slightly debatable as magnesium supplementation during pre-eclampsia and seizures treatment had shown to avert calcium-dependent arterial vasoconstriction and may antagonize the surge in intracellular calcium concentration. A Cochrane review simultaneously with WHO
recommendations on pre-eclampsia and eclampsia prevention and management and consistently reinforced that these minerals supplementation in pregnancy is allied to significant reduction in the pre-eclampsia risk Hofmeyr et al., [26]; Ephraim et al., [27] and Hofmeyr et al., [22]. Therefore, exemptions to the consensus that decreased serum calcium and magnesium levels exist in preeclampsia cases may not be still justified and need further research works.

Conclusion:
Both serum calcium and serum magnesium in preeclamptic pregnant women were lesser in comparison to their healthy pregnant counterparts. These outcomes supported the postulation that there is a cause-consequence liaison between hypocalcaemia and hypomagnesaemia as potential etiologic factors incriminated in of preeclampsia pathogenesis.

Ethical approval: Approval of ethical committee was obtained from quality education assurance unit, Faculty of Medicine, Al-Azhar University Egypt.

Conflict of interest: The authors declare that they have no conflicts of interest.

References


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