

Determination of cancer antigen-125 level and its association with preeclampsia among Sudanese women

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Abstract

Aim: Cancer antigen 125 (CA-125) is suggested to correlate with preeclampsia. This study aimed to determine the association between CA-125 and preeclampsia in Sudan.

Materials and Methods: The study included 40 normotensive women (Control group), and 40 women with preeclampsia, further subdivided into a mild group (n = 23), and severe group (n = 17). Venous blood was taken from all the participants, and determination of CA-125 level was carried out using the sandwich Enzyme-Linked Immunosorbent Assay (ELISA) technique according to the manufacturer's instructions. Data were analyzed using statistical package for social sciences (SPSS-version11.5). Data were expressed in tables and figures as mean \pm S.D. The T-test, One-way ANOVA were used to compare between the groups (cases and control). The Pearson's correlation coefficient was used to assess the correlation between different variables.

Results: The current study showed a significant difference in the mean values of CA-125 in case (52.400 \pm 2.550) and control group (27.800 \pm 6.026 U/ml; p < 0.0001). Women with mild and severe preeclampsia had significantly higher levels of CA-125 (50.869 \pm 1.816, and 54.470 \pm 1.841 U/ml, respectively, p < 0.0001), than in control group. CA-125 levels in mild and severe cases were positively correlated with blood pressure (r = 0.7275, p < 0.0001), and proteinuria (r = 0.3740, p = 0.0174).

Discussion: This study suggests that CA-125 is an essential biochemical marker that should be used to detect the underlying inflammatory process of preeclampsia. Increased cancer antigen-125 level is associated with the severity of preeclampsia. The study confirmed that preeclampsia is positively correlated with blood pressure and proteinuria.

Keywords

Cancer Antigen-125; Preeclampsia; Sudan; ELISA

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Introduction

Preeclampsia is a global pregnancy complication, it affects roughly 3% of pregnant women worldwide and responsible for the increased risk of maternal and fetal morbidity and mortality, universally [1- 4]. Preeclampsia has been subdivided into mild (blood pressure \geq 140/90 and proteinuria \geq 0.3 g/day), and severe (blood pressure \geq 160/110 mm Hg and proteinuria is \geq 5 g/day) after 20 weeks of gestation [5, 6]. The etiology of preeclampsia remains one of the medical obscurities [7, 8], however the indications demonstrated that inherited thrombophilic disorders during pregnancy, placental insufficiency with associated abnormalities such as inflammatory placental decidual vasculopathy, and abnormal trophoblastic invasion of the endometrium may play a role in its pathophysiology [9,10]. Cancer antigen 125 (CA-125) is a high molecular weight glycoprotein (110 to more than 2000kD), first identified in the 1980s by Bast et al. [11]. The normal range of serum CA125 level is less than 35 U/mL [12, 13]. Mainly CA125 is derived from the decidua and amniotic fluid; then it passes to the blood circulation in case of decidual cells damage through chorionic villus invasion in early gestation and during the separation of the placenta [14, 15]. Therefore continuous decidual destruction and separation of trophoblasts from the decidua are suggested to play a key role in the elevation of CA125 levels in women with preeclampsia [16]. Many previous studies have proposed that there is a positive correlation between serum CA125 concentration and preeclampsia [17-20]. So the main objective of this study is to determine the concentration of CA125 level in normotensive and preeclamptic Sudanese women, and then explore its association with the severity of preeclampsia.

Material and Methods

Ethical issue:

This study was approved by the research ethics board at the faculty of medical laboratory science, Alzaiem Alazhari University, Khartoum, Sudan. All enrolled participants signed the informed consent; data were collected on their medical history, socio-demographic and obstetrics characteristics using a structured questionnaire.

Study design:

This is a case-control study conducted at Omdurman maternity hospital and Soba university hospital, Khartoum state, Sudan, from March 2017 to June 2017. The subjects were enrolled in this study during and after 20 weeks of gestation and had similar socioeconomic backgrounds. The study groups included 40 healthy and normotensive pregnant women known as (Control group), and 40 women with preeclampsia (Case group), which further were subdivided into mild preeclampsia group (n = 23) when their blood pressure was $>$ 140/90 mmHg and a proteinuria $>$ 300 mg/day, and severe preeclampsia group (n = 17) if systolic blood pressure increased to at least 160 mmHg, diastolic blood pressure increased to at least 110 mmHg, and proteinuria $>$ 5 g/day [21].

Women with a history of ovarian cancer, endometrial cancer, breast cancer or benign conditions such as chronic hypertension, endometriosis, liver cirrhosis, renal disease, and, cardiovascular disease, were excluded from the study.

To obtain an appropriate serum sample, 3 ml fasting venous

blood was taken under all septic conditions from each group (case and control) of the study, in plain blood containers, and the sample was allowed to clot, then centrifuged at (3000 rpm) for 5 minutes. Serum samples were stored at (-20 °C) until the assay time of CA-125 using the Sandwich Enzyme-Linked Immunosorbent Assay (ELISA) technique according to the manufacturer's instructions (Fortress Diagnostics Ltd, Unit 2C Antrim Technology Park, Antrim, BT411QS, UK).

Statistical analysis

Data were entered and analyzed using statistical package for social sciences (SPSS-version16) on a programmed computer. Data were expressed as mean \pm S.D, and the results were shown in tables. The t-test was used to compare between the two groups (cases and controls). While One-way ANOVA was used to compare the parametric variables of three groups (control, mild preeclampsia, and severe preeclampsia and Tukrey post-test were used for further multiple comparisons between the three groups. The Pearson's correlation coefficient (Pearson's r) was used to assess the correlation between different variables. A p-value of $<$ 0.05 was considered significant.

Results

As can be seen in Table 1 which compares the mean differences of the demographic and clinical characteristics between case and control group, the current study did not reveal any differences in the mean values for the participant's age and gestational age between women with preeclampsia and control group. Our data generally showed a significant difference in the mean values of CA-125 level in case and control group as showed in Figure 1A. Women with severe preeclampsia had significantly higher levels of CA-125 in comparison with the levels of CA-125 in the control group Figure 1B. It was also found that serum level of CA-125 in women with mild preeclampsia revealed significant results in comparison with the control group as illustrated in Figure 1B. There was a positive correlation between CA-125 level and proteinuria, and also there was a positive correlation between CA-125 level and blood pressure in preeclampsia as shown in Figure 2A and Figure 2B, respectively.

Table 1. Demographic and clinical characteristics of cases and control groups (Mean \pm SD)

Characteristics	Normotensive (n = 40)	Mild Preeclampsia (n = 23)	Severe Preeclampsia (n = 17)	P-value
Age (years)	27.6 \pm (6.18)	30.1 \pm (6.54)	30.48 \pm (6.17)	$>$ 0.05
Parity	3.13(1.546)	2.95 (1.767)	3.235(2.165)	$>$ 0.05
GA (weeks)	33.035(2.999)	33.17 \pm 3.157	32.075 \pm 2.877	$>$ 0.05
Systolic B.P	110 \pm 6.83	141 \pm 3.36	162 \pm 8.97	0.00
Diastolic B.P	70 \pm 6.1	83 \pm 4.99	110.6 \pm 3.65	0.001
Proteinuria (g/day)	0.102 \pm 0.01	1.304 \pm 0.47	2.388 \pm 0.795	0.017

agrees with Cebesoy et al.'s study [20] that measured the serum CA-125 levels of women with severe preeclampsia, mild preeclampsia and found statistically significant high results compared to the control group ($p < 0.001$). In contrast, some previous studies did not find any significant differences in CA-125 levels between severe and mild cases of preeclampsia group and control group as in Schröcksnadel et al. [24] study which considered as the first study to compare CA-125 levels of 50 normal pregnant women with 50 hypertensive pregnant women, but no significant findings were noted. The current study also verified the positive correlation between CA-125 level in mild and severe cases of preeclampsia with blood pressure ($r = 0.7275$, $p < 0.0001$), and proteinuria ($r = 0.3740$, $p = 0.0174$). Our study is hospital-based so there were some limitations including the sample size which may not represent the general population level. Further researches are needed to clear up the association of elevated serum CA-125 level in Sudanese women with preeclampsia.

Conclusion

The study concluded that the serum CA-125 level was significantly increased in preeclampsia when compared with the control group; therefore, increased maternal CA-125 levels may be associated with the increase manifestation of preeclampsia.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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