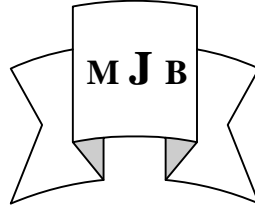


## The Relationship Between Serum Testosterone Level And Antioxidants Status In Pre-Eclampsia

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### Abstract

Pre-eclampsia is a disease characterized by elevation of blood pressure and proteinuria after the 20<sup>th</sup> week of gestation.

Serum levels of testosterone, malondialdehyde, reduced glutathione, catalase, total protein, albumin, globulin, zinc, and copper were determined in sera of 50 pre-eclamptic pregnant and 50 apparently healthy pregnant who served as control.

The results revealed :-A significant increment in the concentration of testosterone ( $p<0.01$ ), malondialdehyde ( $p<0.01$ ) and globulin ( $p<0.05$ ) in sera of pre-eclamptics compared to normotensive pregnant concomitant with a significant reduction in the serum level of reduced glutathione ( $p<0.05$ ), catalase ( $p<0.05$ ), total protein ( $p<0.05$ ) and albumin ( $p<0.05$ ) in sera of pre-eclamptics compared to normotensive pregnant while there is no significant difference in the level of zinc and copper ( $p>0.05$ ) in sera of pre-eclamptics compared to normotensive pregnant. Finally a significant positive correlation between testosterone level and malondialdehyde ( $p<0.01$ ) in sera of both pre-eclamptics and normotensive pregnant, a significant negative correlation between testosterone level and catalase activity ( $p<0.01$ ) in both pre-eclamptics and normotensive pregnant, and significant negative correlation between testosterone, and reduced glutathione ( $p<0.05$ ) in pre-eclamptics; ( $p<0.01$ ) in normotensive pregnant.

### الخلاصة

ضغط الدم العالي لدى الحوامل (قبل الشَّنجِ أحملي) هو مرض يتميز بالزيادة في ضغطِ الدم وإفراز البروتينات في الإدرار بعد الأسبوع العشرين من الحمل.

مستوى التستوستيرون، مستوى الإجهاد، مضادات الأكسدة، البروتين الكلي، الزلال، الزنك (الخارصين) والنحاس تم قياسها في مصل خمسون امرأة حبلية مصابه بقبْل الشَّنجِ أحملي و خمسون امرأة حامل غير مصابة بالمرض (التي تعتبر المجموعة القياسية).

الدراسة أظهرت النتائج التالية :- زيادة هامة في مستوى التستوستيرون ( $p<0.01$ ) وعامل الإجهاد ( $p<0.01$ ) وبروتين ألكلوبولين ( $p<0.05$ ) في مصل المصابات مقارنة بمصل غير المصابات مع انخفاض هام في مستوى مضادات الأكسدة، فعالية إنزيم الكتاليز، ألكلوتاثيون، بروتين المصل الكلي و الزلال ( $p<0.05$ ) في مصل المصابات مقارنة بمصل غير المصابات وأخيرا يوجد ارتباط إيجابي بين مستوى التستوستيرون وعامل الإجهاد ( $p<0.01$ ) في كافة المجاميع مع ارتباط سلبي بين مستوى التستوستيرون و فعالية إنزيم الكتاليز ( $p<0.01$ ) وألكلوتاثيون في كافة المجاميع أيضا.

### Introduction

Pre-eclampsia is defined as the development of high blood pressure with a reading of 140/90mm Hg. or higher, twice over 4hours, without prior comparison accompanied by protein in the urine (at least 300mg/24hours) after the 20th week of pregnancy, which may resolve six weeks postpartum[1]. It is a

common and major complication in pregnancy causing significant morbidity and mortality. Its etiology is still unknown and is considered as a disease of theories[2]. One of these theories refers to the effect of oxidative stress in the corresponding patients. Oxidative stress is an imbalance between the production of free radicals and antioxidants defences

in favour of the first. This imbalance can lead to damage at the macromolecular level including DNA strand, cell membrane, protein and lipid[3]. Malondialdehyde is widely used as an indicator of oxidative stress[4]. Many studies demonstrate a significant association between pre-eclampsia and circulating levels of various biomarkers of oxidative stress others show no association[5,6,7]. In this study, we tried to establish the relationship between serum testosterone level and antioxidants status in pre-eclampsia.

### **Materials and Methods**

The study was conducted in Al-Hilla city, from December 2008 to August 2009. Fifty pre-eclamptic pregnant women which attended different medical centers including Al-Hilla teaching general hospital, and Babylon teaching hospital were enrolled in to this study. Worthy to mention that those patients were not smokers, not alcoholics and not suffering from any other serious systemic illnesses like diabetes mellitus, cardiac diseases, renal diseases and hepatic diseases, so as not to interfere with the result of measured parameters and outcome of the study. These selected pre-eclamptics were divided into two groups according to gestational age:-

-Group (G<sub>1</sub>) includes 25 pre-eclamptics in the second trimester.

-Group (G<sub>2</sub>) includes 25 pre-eclamptics in the third trimester.

Control groups include fifty apparently healthy pregnant women which attended the primary antenatal care center which were also divided into two groups according to gestational age:-

-Group (G<sub>3</sub>) includes 25 normotensives in the second trimester.

-Group (G<sub>4</sub>) includes 25 normotensives in the third trimester.

Serum testosterone was measured using ELISA technique[8], Total protein, albumin, globulin were measured using kits supplied by

Biomegreb company (Tunis)[9,10], zinc and copper were measured by colorimetric methods using kits supplied by LTA s.r.l company (Italy)[11,12]. Malondialdehyde (MDA) was measured by colorimetric technique[13], while reduced glutathione (GSH) determination depends on the action of sulfhydryl group which reduce disulfide chromogen of 5,5'-dithio-bis-(2-nitrobenzoic acid) (DTNB) and change it to an intensely yellow compound (5-thio-2-nitrobenzoic acid) which is proportional to total GSH concentration and measured spectrophotometrically[14]. Catalase activity was determined by the decrease in absorbance due to H<sub>2</sub>O<sub>2</sub> consumption[15].

Statistical analysis was carried out using Student's *t*-test, P-values less than 0.05 is considered significant.

### **Results**

Serum testosterone concentration was significantly higher in pre-eclamptic groups (G<sub>1</sub> and G<sub>2</sub>) (1.55±0.89, 2.48±1.47ng/ml) as compared with normal pregnant groups (G<sub>3</sub> and G<sub>4</sub>) (0.84±0.38, 0.96±0.63ng/ml) (P<0.01). Also serum MDA concentration was significantly higher in the pre-eclamptic groups (G<sub>1</sub> and G<sub>2</sub>) (2.09±0.67, 3.06±0.62µmol/l) compared to normal pregnant groups (G<sub>3</sub> and G<sub>4</sub>) (1.17±0.48, 2.13±1.01µmol/l) (P<0.01). While a significant decrease in mean of serum catalase activities in pre-eclamptic groups (G<sub>1</sub> and G<sub>2</sub>) (0.65±0.26, 0.5±0.29k/ml) was found when compared with the mean of normal pregnant groups (G<sub>3</sub> and G<sub>4</sub>) (0.86±0.32, 0.76±0.44k/ml) (p<0.05) and the same thing to serum level of GSH (20.95±4.68, 17.66±4.68 µmol/l) in pre-eclamptics compared to normotensive (24.18±4.13, 23.29±5.63 µmol/l).

Data obtained from measurement of

serum Zn and Cu concentrations revealed no significant differences between their levels in pre-eclamptic groups (G<sub>1</sub> and G<sub>2</sub>) (122.08, 121.4μg/dl) and apparently healthy pregnant (G<sub>3</sub> and G<sub>4</sub>) (122.68, 121.72μg/dl) (p>0.05). The characters of selected groups were mentioned in table (1).

Beside these results, we found a significant positive relationship between serum testosterone and MDA (P<0.01) as in fig.(1) and significant negative relationship between serum testosterone and catalase as in fig.(2), and GSH as in fig.(3).

### **Discussion**

Those mentioned changes in the measured biochemical parameters can be attributed to :-

1. The significant increase in testosterone level in the sera of pre-eclamptic patients compared with normotensive pregnant with concomitant increase in serum MDA concentration of patients indicate a remarkable correlation between hyperandrogenemia and oxidative stress in PE [16,17].
2. The decrease in serum GSH and catalase in pre-eclamptics can be attributed to the imbalance between antioxidants and oxidants in corresponding patients [17].
3. The non significant changes in the level of Cu, Zn, and Zn/Cu ratio in pre-eclamptics compared to normotensive pregnant indicate the noninvolvement of those elements in the pathogenesis and pathological consequences of the corresponding disease.

These changes in the measured biochemical parameters in pre-eclamptic women necessitate the measurement of the hormone as a risk factor for the disease and its complications.

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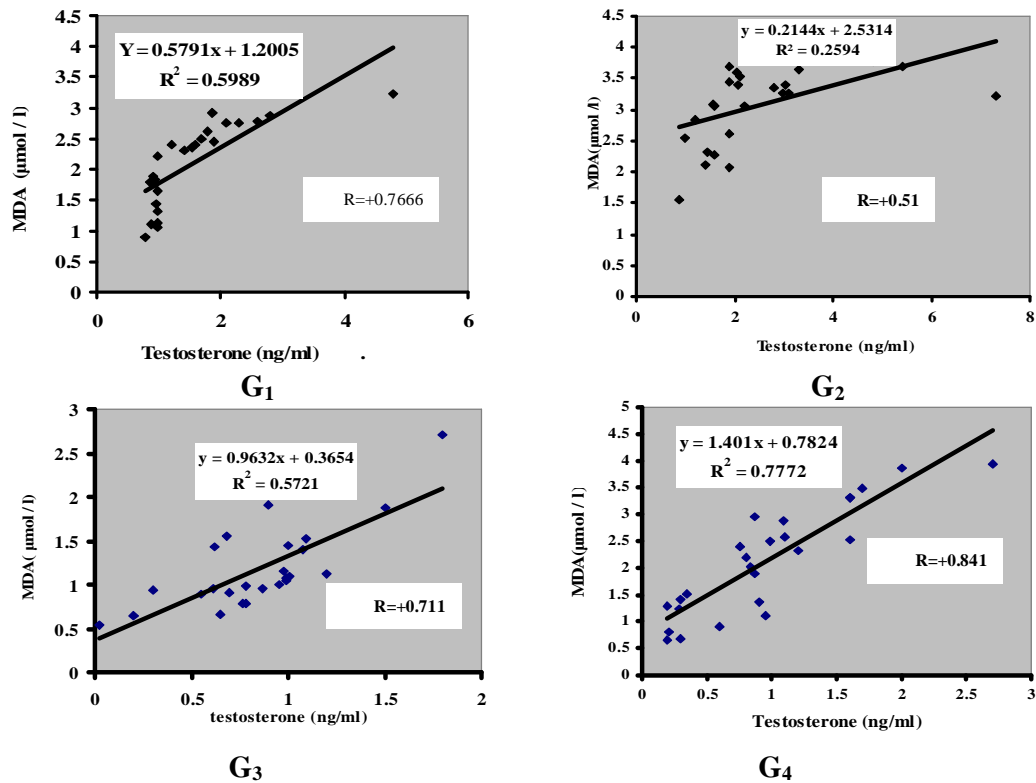
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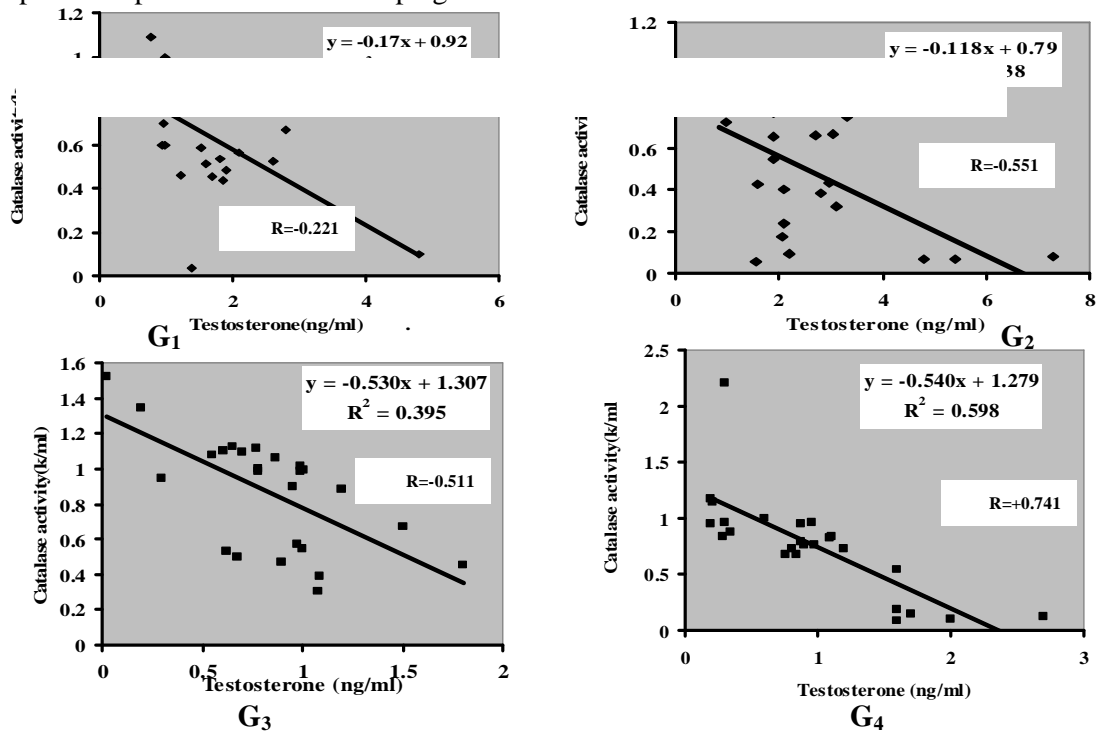
**Table 1** Characters of the studied groups

Characters	G1	G2	G3	G4
Number	25	25	25	25
Age range(Years)	18 – 35	19 – 37	18 – 35	19 – 35
Age (Years) (Mean ± SD)	25.36 ±5.02	25.60 ±5.26	25.88 ±5.36	25.28 ±4.54
Gestational age range (Weeks)	20 – 28	29 – 39	20 – 28	29 – 40
Gestational age (Weeks) (Mean ± SD)	23.36 ±2.16	35.28 ±3.03	23.52 ±2.28	34.44 ±3.89
SBP range (mmHg)	140 – 170	140 – 170	100 – 130	110 – 130
SBP (mmHg) (Mean ± SD)	147.20 ±8.30	148.2 ±11.80	118.40 ±7.46	120.00 ±5.00
DBP range (mmHg)	90 – 115	90 – 120	60 – 85	70 –
DBP (mmHg)	95.80 ±7.46	97.20 ±10.11	77.80 ±6.63	79.40 ±3.9

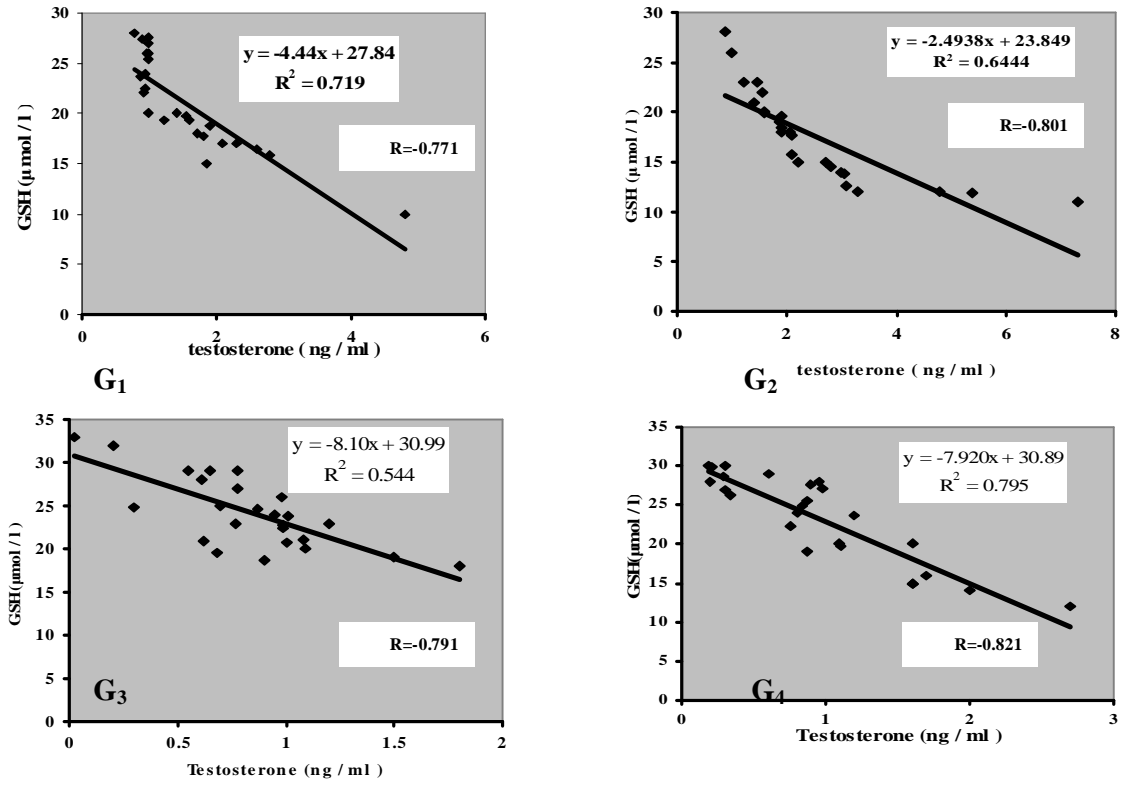
SBP=Systolic blood pressure  
DBP=Diastolic blood pressure



**Fig. 1** The relationship between testosterone level and MDA concentration in the sera of pre-eclamptic and normotensive pregnant.



**Fig. 2** The relationship between testosterone level and catalase activities in the sera of pre-eclamptic and normotensive pregnant.



**Fig. 3** The relationship between testosterone level and GSH concentration in the s era of pre-eclamptic and normotensive pregnant.