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Oxidative stress state during pregnancy period

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Abstract

The present study was designed to find the relation between oxidative stress and pregnancy. The study used one hundred twenty volunteers (ninety pregnant women and thirty non-pregnant women). Then pregnant women were divided to three subgroups according to trimester (first trimester, second trimester and third trimester). then, some oxidative stress factors (MDA, GSH, catalase and TAC) were measurement. Biochemical tests showed significant ($P<0.05$) increase in malonedialdehyied (MDA) and significant ($P<0.05$) decrease in Glutathione (GSH), Catalase (CAT) and total antioxidant capacity (TAC) in pregnant women compared with non-pregnant women group. It was concluded from this study that the pregnancy led to increased oxidative stress and decreased the antioxidant factors.

Keywords: Antioxidant factors, oxidative stress, Catalase, Glutathione.

حالة الاجهاد التاكسدي خلال فترة الحمل

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الخلاصة

صممت الدراسة الحالية لايجاد العلاقة بين الاجهاد التاكسدي والحمل. استخدمت الدراسة مئة وعشرون متطوعة (تسعون امراءة حامل وثلاثون امراءة غير حامل). بعدها. قسمت النساء الحوامل الى ثلاث مجاميع ثانوية اعتمادا على فترة الحمل (الثلث الاول، الثلث الثاني والثلث الثالث). وبعد ذلك، بعض معايير الجهد التاكسدي تم قياسها. الاختبارات الكيميائية اظهرت زيادة معنوية في مستويات MDA وانخفاض معنوي في مستويات الكلوتاثيون والكاتاليز وقابلية مضاد الاكسدة الكلي في مجموعة النساء الحوامل مقارنة مع مجموعة النساء غير الحوامل. يستنتج من هذه الدراسة بان الحمل يؤدي الى زيادة في الجهد التاكسدي وانخفاض في مستويات مضادات الاكسدة.

Introduction

There are many causes of early pregnancy failure, but it now appears that oxidative stress may play a role [1]. Imbalance oxidative stress status occur due to high oxidants produced and defective antioxidants mechanisms [2-3]. A free radical is, by definition, a chemical species containing unpaired electrons and is therefore paramagnetic [4]. Most of oxygen derived free radicals relevant to cell biology are unstable, short-lived and highly reactive [5]. Oxidative stress, resulting from either increased exposure to oxidants or the presence of decreased antioxidant defences, seems to trigger a number of redox sensitive signalling pathways. There is a strong body of evidence to indicate that the

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pulmonary inflammatory response that arises exposure to a pollution episode, is mediated via oxidant signaling pathways [6]. To cope with the oxidative stress elicited by aerobic metabolism, human cells possess developed a ubiquitous antioxidant defense system, which consists of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and glutathione reductase together with a number of low molecular-weight antioxidants such as ascorbate, α-tocopherol and glutathione, cysteine, thioredoxin, vitamins [7-8]. An increase in reactive oxygen species (ROS) elicited oxidative damage to DNA and other biomolecules may impair normal functions of tissue cells and lead to human aging and disease [9-11]. Normal pregnancy is associated with high metabolic demand and elevated requirements for tissue oxygen. There is increased production of reactive oxygen species. This results in increased oxidative stress [12]. So, the aim of this study is find the relation between oxidative stress and pregnancy

Materials & methods

One hundred twenty female volunteers were taken in this study. Ninety pregnant women and thirty non-pregnant women randomly who referred to Al-Dawoody private lab in Kirkuk between December 2015 to Augusts 2016, range of age between (25-40 years). The volunteers were used and divided to four groups (according to trimester) as show in Table-1.

Table 1-The groups of study according to trimester

Groups	Number
First trimester	30
Second trimester	30
Third trimester	30
Non-pregnant women	30

Sample Collection for biochemical analysis

Five milliliters (5ml) of venous blood samples were obtained from the volunteers (at each trimester). All blood samples were dispensed into test tubes for clotting. Sera were obtained after samples were centrifuged at 5000 rmp for ten minutes and stored until assayed for laboratory investigations.

Parameters estimation

Measurement of serum MDA was based on the colorimetric reaction with thiobarbituric acid [13]. Serum TAC was measured by work solution [13]. GSH level estimated according to Mahmood et al. [14].Catalase levels were measured by the procedure of Biovision-USA kits.

Statistical analysis

Data were analyzed using a statistical Minitab program, using analysis of variance (ANOVA) test, in order to evaluate the significance of variability between treated and control groups.

Results

Antioxidant factors (MDA, GSH, catalase and TAC)

The MDA (FT: 1.52 ± 0.06. ST: 1.75 ± 0.11 and TT: 1.94 ± 0.1) in pregnant women group show significant increased ($P < 0.05$) in all trimester during the pregnancy period compared with Non-pregnant women (MDA: 1.31 ± 0.064.) Where, the increased of MDA levels in third trimester appear more then second and first trimester. GSH (FT: 0.59 ± 0.013. ST: 0.41 ± 0.023 and TT: 0.32 ± 0.029), CAT (FT: 1.21 ± 0.04. ST: 1.01 ± 0.06 and TT: 0.87 ± 0.062) and TAC (FT: 1.01 ± 0.08. ST: 0.88 ± 0.1 and TT: 0.74 ± 0.078) show significant decreased ($P < 0.05$) in all trimester during the pregnancy period compared with Non-pregnant women (GSH: 0.79 ± 0.076. CAT: 1.5 ± 0.053 and TAC: 1.3 ± 0.13 respectively). Where, the increased of GSH, catalase and TAC levels in third trimester appear more then second and first trimester as pregnancy advances Table-2.

Table 2-The levels of MDA, GSH, catalase and TAC in serum

Parameters / Groups	MDA (mmol/l)	GSH (mol/l)	Catalase (mmol/l)	TAC (mmol/l)
Control	1.31 ± 0.064 d	0.79 ± 0.076 a	1.5 ± 0.053 a	1.3 ± 0.13 a
First trimester	1.52 ± 0.06 c	0.59 ± 0.013 b	1.21 ± 0.04 b	1.01 ± 0.08 b
Second trimester	1.75 ± 0.11 b	0.41 ± 0.023 c	1.01 ± 0.06 c	0.88 ± 0.1 c
Third trimester	1.94 ± 0.1 a	0.32 ± 0.029 d	0.87 ± 0.062 d	0.74 ± 0.078 d

Note: different letters mean significant changes and same letters mean non-significant changes

Discussion

During normal pregnancy there is a slight increase in oxidative stress, even in the presence of antioxidant systems since the beginning of pregnancy, such as catalase, GPX, vitamin C, glutathione, among others [15]. In study carried by Saikumar et al. (2013) referred that the MDA levels increased as gestation advances [16]. Also, Tiwari et al. (2016) who reported markers of lipid peroxidation (MDA) to be increased during the progression of normal pregnancy. They suggest increased oxidative stress during pregnancy can be deleterious to the health of the fetus and the mother both [17]. Patil et al. (2007) referred that MDA level significantly increased and GSH and catalase significantly decreased in pregnant women. They suggest that pregnant women were more susceptible to oxidative damage than non-pregnants as indicated by increased TBARS and decreased antioxidants [18].

The results of TAC of this study show significant decreased as pregnancy advances that in agreement with Awusha et al. (2016) who reported evaluated the levels of total antioxidant capacity in the various trimesters of pregnancy. They suggest hat pregnancy and increasing gestational age is associated with decreased total antioxidant capacity [19]. Increased in lipid peroxidation MDA and decreased in TAC, and other Antioxidants may be due to oxidative damage in pregnant women and counteract the cellular changes mediated by free radicals [20].The oxidative stress is the principal causal factor, is reflected by increase in MDA and decrease in TAC activity. Significant decrease in TAC is observed in normal pregnant women. A proper balance between oxidative stress and antioxidant systems during pregnancy is important. The involvement of hypoxia/oxidative stress in the path physiology of a variety of pregnancy complications including preterm labor miscarriage, fetal growth restriction and preeclampsia was reported [21].

Conclusion

Increased oxidative stress and decreased the antioxidant factors in the present study as pregnancy advances.

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