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## Measuring the Level of Some Trace Elements in the Serum and Placentae of Pregnant Women Infected with *Toxoplasmosis*

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**Abstract:** The current study deals with *Toxoplasmosis* and the relation of the parasite causing it (*Toxoplasma gondii*), its impact on the levels of trace elements in the serum and placentae of some pregnant women infected with compared to non-infected who are considered a control group. Several trace elements, which included the Selenium (Se), Copper (Cu), Zinc (Zn), Ferrous (Fe), Magnesium (Mg) and Manganese (Mn) were measured, the study was conducted on a sample of (450) women, 225 of them were not infected with *Toxoplasmosis* and 225 were infected, 24 placenta of non-infected women and 18 of infected women. Results showed that there was a significant increase in the levels of Se, Cu, Zn and Mg in the pregnant women serum who are infected with *Toxoplasmosis*, while there was an insignificant decrease in the level of Fe throughout the period of pregnancy for the in the serum of the infected pregnant women. The correlation between the infection and the period of pregnancy showed a significant increase in the levels of Se and Zn during the (3-6 months) period of pregnancy, a significant increase in the levels of Cu and Mg and insignificant increase in Mn level during the (6-9 months) period of pregnancy and on the other hand the level of Fe decreased. Moreover, results showed a significant increase in Se, Fe and Mg levels during the (6-9 months) period of pregnancy and insignificant increase in Cu level during the (6-9 months) period of pregnancy. The levels of Zn and Mn decreased during the pregnancy period in the placentas of the infected women.

**Keywords:** Antioxidants, Placentae, Serum, *Toxoplasmosis*, Trace elements.

### Introduction

*Toxoplasmosis* is a disease caused by *Toxoplasma gondii*, which is considered as Intracellular Parasites and can infect a variety of mid hosts such as rodents, birds and other animals as well as the human (Steven et. al., 2008). *Toxoplasma gondii* are characterized with having several phases responsible for the occurrence of the infection, which are the Alveolar oocyte, Tachyzoites and Bradyzoites located in the tissue cysts (Remington et. al., 2006). Infection with *Toxoplasmosis* for the various types of hosts varies between mild, acute and chronic, where the infection is Asymptomatic for the Immunocompetent host, or similar to flu and could last for few days and most of the persons with natural immunity are healed spontaneously without any diagnosis, unless the relevant blood test is conducted (Lienden, 2005). The immunity system of the host can prevent the multiplication of the parasite and consequently forming the tissue cysts in most of the body tissues, especially the central neural system, skeletal and cordial muscles (Herrmann et al., 2010). From the other hand, symptoms are severe and evident for the patients suffering from immunity deficiency and pregnant. Mothers' infection during the first three months of pregnancy results in abortion, but when infection occurs during the middle months of pregnancy, it results in deformation and jaundice symptoms, liver enlarged and spleen and the infection of the embryo's central neural system resulting to mental retardation, Blindness and Congenital anomalies (Montoya et. al., 2004). Infection during the last three months of pregnancy is not accompanied with clinical symptoms

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for the embryo and it might lead to the birth of children who suffer from dysfunctions in the central neural system and these births are subjected to mortality within about one month or suffer from dysfunction in the eyes and it develops with the infant's age and results in Chorioretinitis and then to Ocular *Toxoplasmosis* (Oktenli et. al., 2004).

The objective of the study is to determine the change of trace elements levels like the Selenium, Copper, Zinc, Iron, Magnesium and Manganese as antioxidants in serum and placenta of the women infected with the disease (weather aborted or not aborted).

## Method

### Collecting the Blood Samples

Blood samples were taken for a various group of pregnant women with ages ranged between 20 to 45 years. The number of the sample was (450) samples of pregnant women infected and not infected with *Toxoplasma gondii*, who were diagnosed by specialized physicians, department of consultancies at Al-Khansaa Hospital for Maternity and obstetrics. Ten millimeters of the veins blood were taken from the patients, put in plastic containers, left to for ten minutes coagulate (clot) in a temperature of 37°C. After that a centrifuge with a speed of 5000 xg was conducted to the blood to obtain serum (Tietz, 1999), for the purpose of measuring the trace elements and then stored at -20°C.

### Collection of Placentae Samples

The number of placenta samples were collected from aborted and unabated women was 24 samples at Al-Khansaa Hospital for Maternity and obstetrics. From the women who suffered repeated abortion with various pregnancy periods (1-3, 3-6 and 6-9 months), 18 placenta sample were collected and put into glass containers which contain Normal Saline (NaCl) with a concentration of (0.9%). To confirm the infection, the direct microscopic test of the placenta extract was performed.

### Parasite Isolation

The pure form of the parasite was isolated from the infected placenta using the following procedures (Sharma et. al., 1981; Dubey et. al., 1986; Al-Khaffaf, 2001).

### Trace Elements

Determining a number of the trace elements represented by Zinc, Copper, Manganese, Magnesium and Iron in the pregnant women serum and placenta extracts using the atomic absorption spectrum (D'Haese et. al., 1992) where the sample were diluted 4 times with the sterilized water that doesn't contain ions (Tietz, 1999), while Selenium was determined by using a modified colorimetric method (Allwsh, 2000).

## Results and Discussion

### Levels of trace elements in the serum of infected and uninfected pregnant women

Results in table (1) show that there is a significant effect in the levels of Zinc and Magnesium in the serum of pregnant women infected and uninfected with *Toxoplasmosis* during the interrelation cases with pregnancy periods at probability level of  $P \leq 0.01$  from the other hand a significant effect of iron was observed at probability level of  $P \leq 0.05$ . Also, a significant increase was observed in the levels of Selenium, Cooper, Zinc and Magnesium in the serum of the pregnant women infected with *Toxoplasmosis* where the levels values were:  $0.24 \pm 0.12$ ,  $7.10 \pm 6.53$ ,  $25.06 \pm 12.58$  and  $0.69 \pm 0.14$  micromole/liter respectively. Also, the results of correlation between the infected cases and pregnancy periods showed increase in the levels of Selenium and Zinc in the serum of pregnant women infected with *Toxoplasmosis* during the pregnancy period (3-6) months as they were:  $0.36 \pm 0.12$  and  $30.30 \pm 15.77$  micromole/liter respectively. The levels of Copper and Magnesium significantly increased during the pregnancy period (6-9) months to be  $7.74 \pm 8.27$  and  $0.73 \pm 0.152$  micromole/liter

respectively. While the level of iron decreased during the pregnancy period (3-6) months to be  $1.27 \pm 0.57$  micromole/liter.

Table 1. The mean  $\pm$  standard deviation of the trace elements in the serum of the infected and uninfected pregnant women.

Variables	No.	Mean $\pm$ SD $\mu\text{mol/L}$					
		Selenium	Copper	Zinc	Iron	Magnesium	Manganese
Uninfected pregnant women	225	$0.07 \pm 0.05$ B	$6.36 \pm 1.12$ A	$16.39 \pm 3.91$ B	$1.44 \pm 0.70$ A	$0.65 \pm 0.14$ B	$0.23 \pm 0.17$ A
infected pregnant women	225	$0.24 \pm 0.12$ A	$7.10 \pm 6.53$ A	$25.06 \pm 12.58$ A	$1.31 \pm 0.67$ A	$0.69 \pm 0.20$ A	$0.30 \pm 0.58$ A
correlation between infection and pregnancy periods							
Uninfected (1-3) months	75	$0.13 \pm 0.04$ C	$6.16 \pm 1.18$ A B	$16.21 \pm 3.76$ C D	$1.57 \pm 0.63$ A	$0.67 \pm 0.10$ BC	$0.13 \pm 0.07$ A
Uninfected (3-6) months	75	$0.05 \pm 0.01$ D	$6.98 \pm 1.07$ A B	$14.12 \pm 3.54$ D	$1.62 \pm 0.81$ A	$0.70 \pm 0.17$ AB	$0.15 \pm 0.03$ A
Uninfected (6-9) months	75	$0.03 \pm 0.01$ D	$5.94 \pm 0.82$ B	$18.84 \pm 2.86$ C	$1.11 \pm 0.54$ B	$0.58 \pm 0.11$ D	$0.10 \pm 0.05$ A
infected (1-3) months	75	$0.18 \pm 0.04$ B	$6.39 \pm 1.40$ A B	$17.62 \pm 6.46$ C	$1.18 \pm 0.59$ B	$0.70 \pm 0.24$ AB	$0.21 \pm 0.18$ A
infected (3-6) months	75	$0.36 \pm 0.12$ A	$7.18 \pm 7.60$ A B	$30.30 \pm 15.77$ A	$1.27 \pm 0.57$ B	$0.63 \pm 0.19$ CD	$0.23 \pm 0.18$ A
infected (6-9) months	75	$0.18 \pm 0.08$ B	$7.74 \pm 8.27$ A	$27.27 \pm 10.01$ B	$1.49 \pm 0.80$ A	$0.73 \pm 0.15$ A	$0.25 \pm 0.16$ A

### Levels of trace elements in the placenta of infected and uninfected pregnant women

Results in table (2) indicate that there is a significant impact in the concentrations of Selenium, Zinc, Magnesium and Manganese in the placenta of pregnant women who are infected and uninfected with *Toxoplasma gondii*, at probability level of  $P \leq 0.01$ .

Table 2. shows the mean and the standard deviation of the trace elements in the placenta of the infected and uninfected pregnant women.

Placenta during pregnancy	No	Mean $\pm$ SD $\mu\text{mol/L}$					
		Selenium	Copper	Zinc	Iron	Magnesium	Manganese
Uninfected placenta	6	$0.12 \pm 0.03$ C	$6.68 \pm 1.70$ A	$12.01 \pm 6.49$ A	$1.67 \pm 0.56$ A	$1.00 \pm 0.15$ B	$0.47 \pm 0.01$ A
Infected (1-3) months	6	$0.64 \pm 0.01$ B	$6.02 \pm 0.01$ A	$10.01 \pm 0.01$ A	$1.48 \pm 0.01$ A B	$0.95 \pm 0.01$ B	$0.23 \pm 0.01$ B
Infected (3-6) months	6	$0.63 \pm 0.01$ B	$7.34 \pm 2.70$ A	$4.66 \pm 1.82$ B	$0.98 \pm 0.01$ B	$0.82 \pm 0.07$ C	$0.23 \pm 0.01$ D
Infected (6-9) months	6	$0.85 \pm 0.16$ A	$5.80 \pm 0.88$ A	$3.33 \pm 0.01$ B	$1.67 \pm 0.74$ A	$1.14 \pm 0.07$ A	$0.23 \pm 0.01$ C

Within columns, means having the same letters don't differ significantly at  $p \leq 0.05$ .

Also, the results in table (2) showed that there is a significant increase in the concentration of Selenium in the placenta of the infected pregnant women during the pregnancy period (6-9 months) as the concentration was  $0.85 \pm 0.16$  micromole/liter and there was no significant increase in iron level compared to its level in the

uninfected pregnant women placentae. Also, the level of Magnesium significantly increased in the infected women placentae during the pregnancy period (6-9 months) as it was  $1.14 \pm 0.07$  micromole/liter, while the levels of Zinc and Manganese significantly increased in the infected women placentae to be  $3.33 \pm 0.01$  and  $0.23 \pm 0.01$  micromole/liter respectively.

The results of the current study show that there is a significant increase in the levels of Selenium, Copper, Zinc and Magnesium but Manganese showed no significant effect and a decrease in the level of iron in the serum of the pregnant women who are infected with *Toxoplasma gondii*, compared to the uninfected women during the various pregnancy periods. From the other hand the levels of Zinc and Manganese decreased significantly in the placentae of the infected women compared to the uninfected women. Iron didn't show a significant effect, but the levels of Selenium and Magnesium increased significantly in the placentae of the infected women, whereas Copper didn't reach a statistical significance. The reason behind the decrease of Iron in the pregnant women serums may be due to its capture by the Albumin as an antioxidant, which captures several metals inside the human body such as the free Iron and free Copper (Iqbal et. al., 2004), in addition to that, the lack of iron ions during pregnancy is due to using large amounts to build the body cells especially red blood cells needed by the pregnant (Choi et. al., 2000) and also the amounts of iron decrease with the period of pregnancy (Tam et. al., 2002). The increase of Copper level in the pregnant serum may be attributed to the disorders between the effectiveness of Sodium ion transferring systems and the level of Copper in the serum, because the decrease in the effectiveness of these systems due to oxidation stress is accompanied with increase in Copper level in the serum (Avkiran, 2001; Bober et. al., 2002; Eshratkhan et. al., 2008; Seyrek et. al., 2009). An imbalance of other elements (Selenium, Zinc and Manganese) was observed, which ranged between increase and decrease in the serum of pregnant women infected with *Toxoplasma gondii*. The decrease is due to using Zinc ion with high amounts as an escort to the superoxide dismutase enzyme (SOD), which shows its effectiveness with the presence of Zinc, Copper and Manganese and which is used to remove Super oxide anionradced radicals and then it is transformed into hydrogen peroxide which is an oxidant compound free of the free radicals (Saczko et. al., 2002).

## Conclusion

The objective of the study is to determine the change of trace elements levels like the Selenium, Copper, Zinc, Iron, Magnesium and Manganese as antioxidants in serum and placentae of the women infected with the disease (weather aborted or not aborted).

## Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPSTEM journal belongs to the authors.

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