Study the Effect of Chronic Toxoplasmosis on Serum Testosterone Level in Men

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Abstract

Toxoplasma gondii (*T.gondii*) is an obligate intracellular protozoon which infects both human and animals. *T. gondii* parasitize in different organs even in testes and it was isolated from semen. The level of testosterone in the serum was evaluated for men with chronic toxoplasmosis.

One hundred twenty-one blood samples were collected from apparently healthy men with different age groups they were attending the teaching hospital in Al-Diwaniyah province. Three milliliters of blood was drawn from each man, and then sera were separated by centrifugation. Anti-Toxoplasma IgG antibody was detected. Same numbers of positive and negative sera were included in cases and controls groups respectively, and then the quantitative determination of testosterone was analyzed in the serum of both groups.

Thirty eight (31.4%) out of 121 examined serum samples were given positive results for *T.gondii* IgG antibodies. The concentration of testosterone, in case group was relatively more than in the control group with no statistical differences ($p>0.05$). According to age, the comparison of testosterone in two groups appeared that testosterone level in 15-29 age in case group was with significant differences ($P<0.05$).

From the current study we concluded that the infection with *T.gondii* can affect the serum testosterone level in men.

Keywords: *Toxoplasma gondii, Toxoplasmosis, Testosterone.*

Introduction

Toxoplasmosis is a zoonotic disease, caused by *T.gondii*, a protozoan of widespread in the world [(1)]. The infection with *T. gondii* is mainly obtained by the ingestion of tissue cysts within raw or undercooked meat or the consumption of contaminated food or water with sporulated oocysts [(2-3)]. Generally, this disease is without clinical signs, but it may lead to local lymphadenopathy disorders, hydrocephalus, and calcification of intracranial, choriorenitis, microcephaly and deafness in newborns and death of immunodificient patients [(4-5)]. Many obstetrical problems may be associated with toxoplasmosis, as it leads to miscarriage of pregnant women or the birth of children with congenital defects, especially if the parasite infection occurs in the first trimester of pregnancy [(6)]. In males *T.gondii* also invade the reproductive system and cause defect in testicular functions [(7)], so the chronic phase showed changes in the men generative parameters [(8)].

Many studies were conducted around the world related to men toxoplasmosis which concentrated on the effect of infection on the parameters of male hormones [(9)]. In Iraq few or absent like studies regarded to the effect of *T.gondii* infection on level of serum testosterone in

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men, so for this reason the aim of this study was develop.

Materials and Methods

One hundred twenty-one blood samples were collected from apparently healthy men, their ages ranged between 15 - 80 years who were attending the teaching hospital in Al-Diwaniyah province. The ages were category into four categories (15-29, 30-44, 45-59 and ≥ 60 years) and some information about housing (rural or city) was taken first and they were raised by cats.

Three milliliters of venous blood was drawn from each man and collected in serum gel tubes, then sera was separated by centrifugation (3000 cycles/minutes for 3 minutes) at room temperature. The sera were kept at (-20˚C) till used. The sera were analyzed to detect the anti *T. gondii* antibodies by used ELIZA technique (*T.gondii* IgG EIA kit; Foresight, Germany). Next, two groups were used in the comparisons, the case group which includes the positive sera and control group which included the equal number of negative sera. Testosterone ELIZA kit (Vida Lab, France), was utilized for quantitative determination of testosterone in cases and controls, where duplicate of all standards, samples, and controls were done. The standard curve was used to calculate the testosterone concentrations in samples. For both *T. gndii* IgG and testosterone evaluating, procedures have been implemented, according to the manufacturer's directions. Then necessary statistical analysis was done.

Results

The result of the current study revealed that 38 (31.4%) out of 121 examined serum samples were given anti *T. gondii* IgG antibodies positive results**.** The 30-44years age group had the highest infection rate (47.37%) compared to other groups with significant differences ($p<0.05$). In spite of the incidence in the urban was higher (39.14%) than in rural areas, also the people who had contact with cats were revealed higher infection rate (35.71%) than those who had no contact with them, but there were no significant differences ($p>0.05$) showed among these comparisons (Table 1).

Table (1): The IgG seropositive of *T.gondii* infection according to the age, residence and cat contact.

Age (year)	No. of examine	No. of +ve IgG	%
15-29	57	14	24.56
30-44	23	11	47.37*
45-59	22	8	36.36
≥60	19	5	26.31
Total	121	38	31.4
X2:- 9.869 p-value:0.019 *:significant differences(p<0.05)			
Residence	No. of examine	No. of +ve IgG	%
Urban	82	28	39.14
Rural	39	10	25.64
Total	121	38	31.4
X2:-2.813 p-value:0.093			
Cat contact	No. of examine	No. of +ve IgG	%
Yes	28	10	35.71
N0	93	28	30.1
Total	121	38	31.4
X2:-0.478 p-value:0.489			

Regarding to the quantitative determination of testosterone concentration, the results revealed that this hormone concentration in case group (1.1497 ng/ml) was relatively higher than in the control group (1.1387 ng/ml), with non-significant differences (p>0.05) between them (Table 2).

Table (2): Testosterone concentration in case and control groups

Group	number	Testosterone concentration (ng/ml) Mean	Std. D	P-value
Case	38	1.1497	0.00006	1.00
Control	38	1.1387	0.00006	1.00
Non-significant differences (p >0.05)				

According to age, the testosterone in two compared groups appeared that it's level in 15-29 age in case group was statistically differences (P<0.05). (Table 3).

Table 3: Comparison among concentrations of testosterone in case and control groups according to age

Age (year)	Mean of testosterone concentration in case group (IU/ml)	Mean of testosterone concentration in control group (IU/ml)	P-value
15-29	1.143 ±0.0011	1.139 ±0.0015	0.048*
30-44	1.140 ±0.0014	1.138 ±0.0008	0.244
45-59	1.142 ±0.0022	1.137 ±0.0015	0.322
≥60	1.145± 0.0036	1.142 ± 0.0017	0.457
*significant differences(p<0.05)			

Regarding to the habitat, there was statically non-significant (p >0.05) in comparison of testosterone concentration level in both urban and rural habitant in case group and control groups. (Table 4).

Table (4): Comparison among concentrations of testosterone in case and control groups according to habitat

Habitat	Mean of testosterone concentration in case group (IU/ml)	Mean of testosterone concentration in control group (IU/ml)	P-value
Urban	1.140 ±0.0015	1.139 ±0.0012	0.566
Rural	1.142 ±0.0019	1.138 ±0.0013	0.133
Non-significant differences (p >0.05)			

Discussion

Toxoplasma gondii is consider as an important protozoa pathogens that infect both human and animals, causing many severe affects which can develop to death in immunocompromised individuals [10]. The results indicated a high rate of infection among males in different age groups, especially in the 30-44 years group with significant differences ($p<0.05$). This result come to an agreement with Tabbara *et al.,* [11] in Saudi Arabia, Al- Rubaia, [12] in Iraq and Shin *et al.*,[13] in Korea, where all these studies referred to increase of infection rates among patients of 20-40 years. The rises of infection in this age stage may be due to the cumulative exposure to it with the advancement of age, in addition to this stage is a childbearing in women, in which it is exposed to stress factors due to pregnancy, which negatively affects the level of the body's immunity, so the work of an early screening of antibodies against *T. gondii* at Pregnant women are important to control abortions or fetus congenital defects caused by an infection Han *et al.,* [14].

With reference to the residence, the urban areas showed high infections in compare with rural (39.14% and 25.64% respectively), in spite of there is no statistical difference ($P>0.05$). This finding is in consistent with the previous study performed by Razzak, [15], whereas do not match what came in some other studies which confirmed that the infection of women in rural were more than in urban areas [16-17]. These differences in infection rates may be attributed to factors related to the way of feeding and contact with cats, as well as other factors related to the level of health services and environmental conditions [18].

In other hand, testosterone concentration mean of both case and control groups was in normal range and without significant difference ($P>0.05$). A comparison of testosterone levels appeared that the hormone concentration was relatively higher in the case group than in the control group at ages 15-29 years with significant differences, while no significant difference was observed when comparing the case group and the control group in the urban and rural. This result come to an agreement with the result of Lim *et al*., [19] who referred to that the infection with *T. gondii* leading to a long-term increase of testosterone, where experimentally a *Toxoplasma gondii* attack the testes in laboratory rat [20-21] and making changes in the synthesis of testosterone and nucleus accumbal dopamine content in this animal model [19- 22]. Zouei *et al.,*[23] had reported elevated of testosterone concentration in study group as compared to control group.

A significant relation had been reported between IgG anti Toxoplasma antibodies and testosterone [24], and the results are differ according to the protozoan strain type [25].

Most testosterone is synthesis in testicular Leydig cells and luteinizing hormone receptor (LHR) is play an important role as regulator of steroidogenesis [26-27]. *T.gondii* infected animals showed with high mRNA expression of luteinizing hormone receptor that will lead to high testosterone production (LHR) [28-29-19].

Many studies that have been emphasize a presence of correlation between infection with chronic toxoplasmosis and disorders in male's reproductive parameters [30-31-25]. Terpsidis *et al.*[31]showed rising of sperm abnormalities in infected mice. Some other studies referred to decrease the hormone level in both sexes of mice infected with virulent strain T38 of *T. gondii* [25], while others didn't determine if *Toxoplasma* can affect the testosterone level or no [32-33-34].

The level of hormones can change in some conditions, and alter effects on the immune system may cause resistance stimulation or exposition to different parasitic attacks. Toxoplasmosis can increase in elevated acute sexual steroids, mainly by inhibiting the immune endocrine network (IEN) and provided that parasite replication [35].

Although it has been thought that the *T. gondii* infection is asymptomatic in immune-competent individuals and they seem apparently healthy, indeed a hidden infection is present lead to change and raise the level of testosterone hormone [34-36-37].

Conclusion

Toxoplasmosis is more affective and can cause increasing in testosterone level during the active period of maturity in men.

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