



Sex-associated hormones and *Toxoplasma gondii* infection

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ABSTRACT

Serologic evidence indicates that human infections by toxoplasmosis are common in many parts of the world. Hormones could induce anti-parasitic functions of the host immune system and there is a wealth of evidence that illustrates the ability of sex-associated hormones to influence directly a variety of diverse immunological function. This study aimed to investigate the correlation between the prevalence of toxoplasmosis and certain levels of sex-associated hormones (progesterone, estradiol & testosterone). The study was carried out in the city of Sharjah -UAE at the blood transfusion and research center with 85 participants included in the study 49 female and 36 males, mean age (SD±) 31.88 ± 6.156 and 35.69± 9.591 for females and males respectively. ELISA test kits for detection of Anti- *Toxoplasma* IgM was used to screen the samples. The level of serum progesterone, estradiol, and testosterone in *Toxoplasma* positive samples was measured using ELISA test kits. From the 85 studied subjects, a total of 24 were found to be positive for anti-*Toxoplasma* IgM using ELISA test, corresponding to an overall prevalence of 28.2%, 9/49 females (18.4%) and 15/36 males (41.6 %).The negative samples were used as a control. There was a significant positive correlation between the level of testosterone and anti-*Toxoplasma* IgM in men and a significant negative correlation between the levels of testosterone, progesterone and anti-*Toxoplasma* IgM in women $p < 0.05$. However estradiol showed insignificant correlation with anti-*Toxoplasma* IgM $p > 0.05$.

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INTRODUCTION

Toxoplasmosis caused by the intracellular parasite *Toxoplasma gondii* (*T.gondii*) is a zoonotic infection of cosmopolitan distribution. Parasites are able to exploit hormonal microenvironment within the host to establish an infection and avoid the eradication by evolving receptors for host hormones (1) There is currently considerable evidence that steroid hormones affect the course of toxoplasmosis in humans and mice. A wealth of evidence has accumulated that illustrates the ability of sex-associated hormones to influence directly a variety of diverse immunological functions. Henry and Beverley (2) were the first to demonstrate differences in the immune and inflammatory responses of male and female mice following infection with *T. gondii*. In these studies, female mice developed more severe brain inflammation than male mice following infection.

METHODS AND MATERIALS

Participants and serum samples:

This study related to toxoplasmosis was carried out in the city of Sharjah -UAE at the blood transfusion and research center with 85 participants included in the study 49 female and 36 males. Mean age (SD±) 31.8 ± 5.09 and 32.8± 5.57 for females and males respectively. Subjects were classified according to nationality and age groups .Blood samples were collected and sera were stored at -20°C until use for screening.

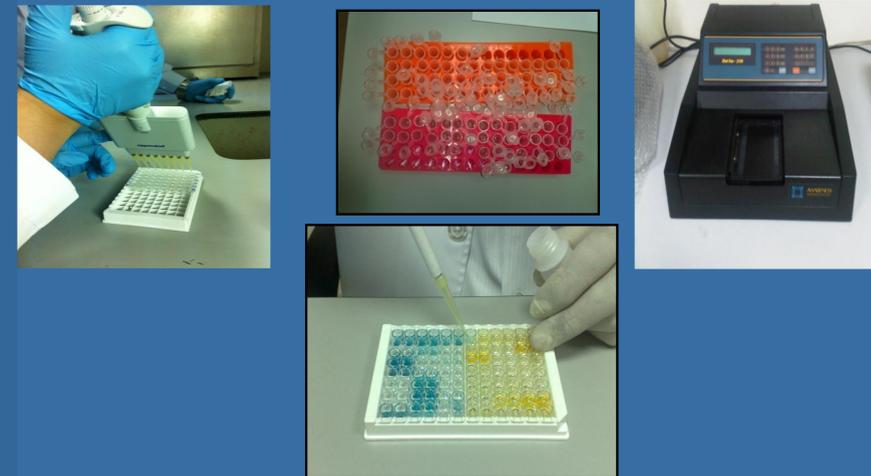
Toxoplasma IgM ELISA TEST:

Enzyme-linked immunosorbent assay (ELISA) test kits (Diagnostic automation company-USA - Cat # 1102z) for detection of antibodies against *Toxoplasma* were used to screen all the test samples according to the manufacturer's instructions.

Hormonal assays:

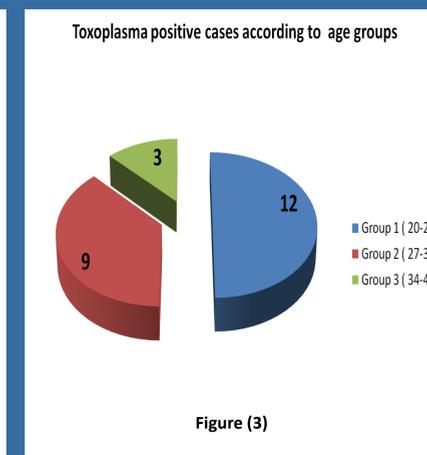
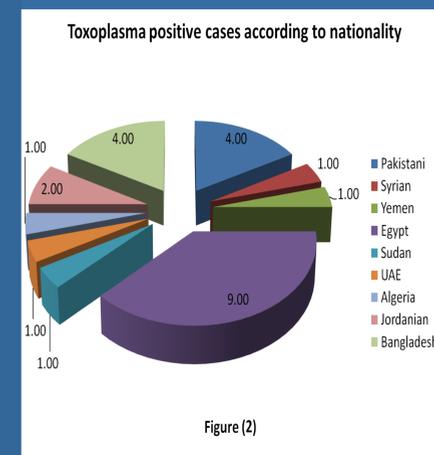
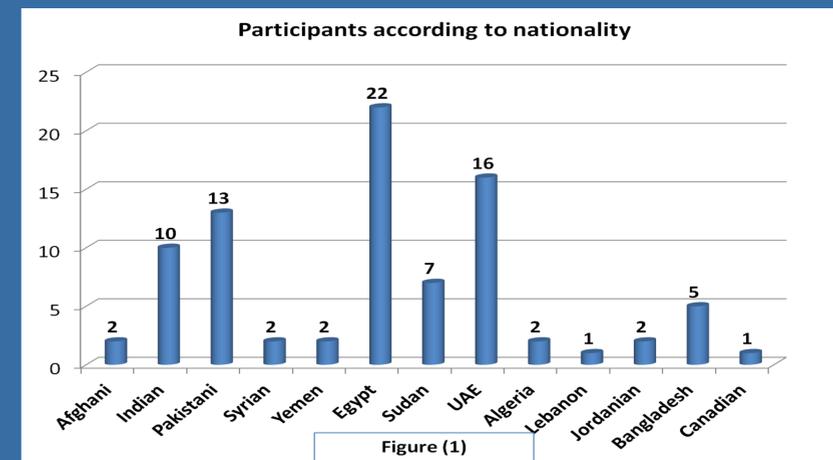
Enzyme-linked immunosorbent assay (ELISA) test kits (Diagnostic automation company-USA - Cat # , 2077Z, 2046Z and 9052-16 for analysis of the level of serum progesterone, estradiol, and testosterone were used.

Results



The overall prevalence of infection was 28.2 9%, 9/49 females (18.4%) and 15/36 males (41.6 %). Optical density (OD) ≥ 1.10 or more was considered positive. The mean OD for for IgM (SD±) was 0.428 ± 0.231. The mean values for all hormones was 2.1 (SD±) 2.37 ng/ml, 45.88 (SD±) 56.61 pg/ml and 2.22(SD±) 4.97ng/ml for testosterone, estradiol and progesterone respectively.

There was a significant positive correlation between the level of testosterone and anti-*Toxoplasma* IgM in men and a significant negative correlation between the levels of testosterone, progesterone and anti-*Toxoplasma* IgM in women $p < 0.05$. However estradiol showed insignificant correlation with anti-*Toxoplasma* IgM . $p > 0.05$. The highest percentage of infection was noticed among Egyptians and in age group (20-26 year) Figure 2 and 3 respectively.



DISCUSSION

Our study showed a significant positive correlation between the level of testosterone and anti-*Toxoplasma* IgM in men. The current results support the report of Zghair *et al.*, (3). Moreover, another study done in 2014 (4) is well in line with our fore mentioned results.

It was evident in our study, that there was a significant negative correlation between the levels of testosterone and anti-*Toxoplasma* IgM in women. These findings are supported by a study that was done by Flegr *et al.*, (5) in 2008.

Al-Warid & Al-Qadhi (6), demonstrated that acute toxoplasmosis is always related to lower concentration of progesterone and estrogen. On the contrary estrogen showed insignificant correlation with *Toxoplasma* infection in our study.

Furthermore other studies proved that progesterone & 17 β -estradiol levels can aggravate or reduce parasite reproduction (4).

The gender differences may be due to the different exposure to parasite infective stage. Also the level of sex hormones varies according to age and gender-associated differences in behavior .

CONCLUSIONS

From the present study, it is possible to confirm the previous recommendations of some authors who emphasized sex associated hormones can aggravate or reduce *Toxoplasma* infection. Further studies are needed to investigate and correlate different genotypes of *Toxoplasma* and the levels of sex-associated hormones in specific age groups.

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