

The relationship of infection with *Toxoplasma gondii* and the incidence of tachycardia and effect of infection on some biochemical parameters

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DOI: 10.47750/pnr.2022.13.S06.042

Abstract

The study aimed to find out the effect of infection with *Toxoplasma gondii* and the incidence of tachycardia. With the effect of injury on the levels of creatine kinase, lactate dehydrogenase and troponin in the blood serum, from the beginning of October 2021 until the end of February 2022. 96 blood samples were taken from patients who visited the outpatient clinics of cardiologists and Samarra General Hospital. The samples were divided into three groups, the first were those with heart disease and *Toxoplasma* parasite, the second were those with heart disease only, and the third was the control group. The separated serum was kept at a temperature of (-20) until use. Enzyme-linked immunosorbent assay (ELISA) was used to detect toxoplasmosis. The same technique was also used to detect the levels of lactate dehydrogenase, creatine kinase and troponin. The results of the study showed a significant increase at the level of significance ($P < 0.05$) in the levels of (Troponin), (CK) and (LDH). In the group infected with *Toxoplasma* parasite compared to the control group. On the other hand, it was found that there were significant differences at a significant level ($P < 0.05$) in the levels of (Troponin), (CK) and (LDH) between the group infected with *Toxoplasma* and heart diseases with the group with heart diseases. Just.

Keywords: Toxoplasmosis, tachycardia, biochemical parameters.

INTRODUCTION

Toxoplasma gondii is a parasitic protozoan that can infect many host species of mammals and birds, including humans, causing toxoplasmosis. It infects many intermediate hosts such as rodents, birds, farm animals and wild animals, as well as humans (Jungersen et al., 2001; Wilson and McAuley, 2009). *Toxoplasma gondii* is one of the protozoa that is obligatory intracellularly parasitic (Dubey, 2010; Jimenez-Coello et al., 2012). Cardiovascular diseases are the most common cause of death and are responsible for about 30% of deaths worldwide (Sans et al., 1997). Palpitations are one of the most common complaints of patients who presented to emergency departments, primary care providers or cardiologists, One study indicated that 16% of patients who presented to the primary care center had heart palpitations (Weitz and Weinstock, 1995). Studies have shown that patients with chronic cardiovascular disease are often exposed to opportunistic infections such as toxoplasmosis due to the general body weakness and immunodeficiency state. In a 2006 study conducted in Mexico, a significant relationship was found between toxoplasmosis and chronic cardiovascular disease (Alvarado-Esquivel et al., 2016). Undoubtedly, the socioeconomic toll caused by this disease along with the transformations caused by this parasite In the human body it can be costly to society compared to other diseases (Yousefi et al., 2017).

The study aimed to investigate the effect of *Toxoplasma* infection and the occurrence of tachycardia, with the effect of infection on the levels of creatine kinase, lactate dehydrogenase and troponin in the blood serum.

Materials and methods:

1- Sample collection: The study included the collection of 96 serum samples collected during the period from (October 2021) to (February 2022). Airtight without anticoagulants, centrifuge for 10 minutes at 3000 rpm, after leaving tubes at room temperature 25°C until coagulation. Then the serum was withdrawn by micropipette and placed in clean, sterile tubes and kept in a frozen state at (-20) °C until the tests under study were carried out.

2- Study design: The study groups were divided into three groups: (with heart disease and Toxoplasma parasite, patients with heart disease only, control group). To verify the class of IgM and IgG antibodies to Toxoplasma parasite, ELISA was used using the standard method manufactured by (German Human). The levels of (Troponin), (CK) and (LDH) were checked using the standard method. Manufactured by the same manufacturer.

3- Statistical analysis: The results obtained from the current study were analyzed using the SPSS statistical program, and Dunkin' polynomial test was used to compare three groups at the level of differences between the averages of the totals.

Results and discussion: The results in Table (1) showed an increase in LDH levels of 2.6960 ± 0.4531 . In the group infected with *T. gondii* and heart disease, and the group with heart disease only 1.7808 ± 0.2561 , compared to the control group 1.2548 ± 0.1702 .

Table (1): levels of some biochemical parameters in study group.

Groups Parameters	Control Mean± St.d	Toxoplasma &CVD Mean± St.d	CVD Mean± St.d	P-Value
LDH (ng/ml)	1.2548 ±0.1702 c	2.6960±0.4531 a	1.7808±0.2561 b	0.00006
CK (ng/ml)	101.08±15.881 c	256.60±19.90 a	170.98±12.26 b	0.0009 **
Troponin	132. 65±18.17 c	259.70 ±26.23 a	199.43 ±21.91 b	0.0007 **

The current study is in agreement with the study (Vanessa et al., 2016), where this study found an increase in LDH levels in groups infected with Toxoplasma parasite and heart disease than in control group. The main reason discovered so far is attributed to the fact that the damage caused by the parasite leads to an imbalance in control of LDH levels and their rise above normal levels (Vanessa et al., 2016).

The results of the current study are in agreement with the results of the study (Wenfang et al., 2022) where it was found that LDH levels were positively associated with CVD risk, and independent of the classic cardiovascular risk factors. These changes in LDH levels persisted even after continuing to take medications. The level of LDH in blood is closely related to the incidence of CVD. Moreover, LDH is involved in lysosomes as this scenario affects the blood supply to the myocardium.

At the same time, a certain concentration of LDH will be released into the blood. Which was in agreement with the results of this study, and high-risk factors for cardiovascular diseases (such as smoking and high blood pressure) affect the function of the cardiovascular system to varying degrees, leading to different degrees of cell damage in tissues (such as muscles) and organs (for example, Heart, liver, kidneys). As for LDH found in different types of cells, if it is released into the blood, this leads to an increase in the level of LDH. If the LDH level increases to a certain extent, this indicates the presence of serious tissue lesions, myocardial infarction, liver failure, or damage to other important organs, which is consistent with our data showing that LDH level is positively correlated with CVD. As for the difference between the groups, it was found that there are significant differences between the group infected with Toxoplasma parasite and heart diseases with the group with heart diseases only. This shows the role of the Toxoplasma in causing a disorder and defect in the secretion of LDH, which leads to an increase in this enzyme as explained by (Vanessa et al, 2016).

The results of the study showed an increase in CK levels, 19.90 ± 256.60 in the group infected with *T. gondii*, heart disease and the group with heart disease only 12.26 ± 170.98 , compared to the control group 15.881 ± 101.08 . The results of the current study are in agreement with the results of the study (Vanessa et al., 2016), where the results showed that CK has an increased activity in the groups infected with *Toxoplasma* parasite and heart diseases, this increase in CK can be justified by the mechanism of the interrelationship between enzymes. *T. gondii* is also believed to cause an increase in ATP consumption. CK is an important enzyme that stimulates energy metabolism and is involved in the production and delivery of ATP (adenosine triphosphate) (Janssen et al. 2003; Segal et al., 2007). The enzyme CK is usually found in organs that require large amounts of ATP, such as the brain, heart, and skeletal muscles (Gloria-Bottini et al., 2011). The study (Matthews et al., 1997) indicated a high level of CK enzyme activity in heart patients, as this study agreed with the results of the current study, as most heart diseases are accompanied by a high level of activity. This enzyme and this rise result from the presence of this enzyme in high concentrations in cardiac muscle cells, and the occurrence of heart diseases leads to the destruction of these cells and then releases their content of this enzyme into the bloodstream and at certain concentrations close to the defect that occurred in the heart tissue. The increase in CK may be due to the morphological changes that occur in the heart muscle after it has been infected with diseases such as tachycardia, which leads to fibrosis of the affected area. With regard to the difference between the group of people with heart diseases and *Toxoplasma* with the group of people with heart diseases only, it was found that there were significant differences between the two groups with a large difference between the results of those infected with *Toxoplasma* and heart diseases, which confirms the effect of this parasite by changing the ratio of this enzyme by a large percentage, but still the mechanism of influence of this parasite in the events This significant change in the percentage of the enzyme is unknown.

The results of the study showed an increase in TnI levels, 259.70 ± 26.23 in the group infected with *T. gondii* and heart disease and the group with heart disease only 21.91 ± 199.43 compared to the control group 18.17 ± 132.65 . The results of the current study are in agreement with the results of the study (Omid et al., 2020), where this study showed that infection with *Toxoplasma* parasite and heart disease leads to an increase in TnI levels than Normal limits, as TnI causes cardiac muscle contraction. Myocardial injury is determined by the TnI test. Heart damage leads to an increase in the concentration of TnI in blood. This test is one of the most important tests that help diagnose a heart attack, and this enzyme is released into the bloodstream when the heart muscle is damaged. The current study did not agree with the results of the study (Vanessa et al., 2016). Where this study showed that there were no significant differences between the group of people with heart diseases and *Toxoplasma* and the control group, the results of the current study are interesting, which shows the role of *Toxoplasma* in causing damage or damage to the heart muscle. The mechanism of *Toxoplasma* effect on the TnI enzyme is still unknown and needs further study. With regard to the results of the group with tachycardia compared to the control group, the results of the current study agreed with the results of the study (Jussi et al., 2020).

This study found that ventricular elevation of heart rate was significantly associated with TnI secretion in patients who were examined with symptoms of tachycardia. Persistent mild elevation of troponin levels is a common finding in tachycardia, but the underlying cause remains unclear. The results of this study indicate that insufficient ventricular rate control in the acute setting was associated with increased troponin levels. These results indicate that elevated heart rate was independently associated with troponin secretion in patients with palpitations.

The results of the current study agree with the results of the study (Amit et al., 2022), in which 3121 patients with tachycardia were examined, and for whom troponin was measured, there was a significant association between troponin levels (above the maximum allowable) and a higher rate of Myocardial damage. Increased troponin has prognostic significance for many cardiac and pulmonary problems, such as heart failure, pulmonary embolism, and sepsis. We cannot directly infer, from our analysis, a mechanism of troponin secretion nor the mechanism by which troponin increases are associated with the diagnosis of tachycardia, but our results raise the possibility that the clinical significance of troponin secretion in palpitations may be mediated by CVD. With regard to the difference between the group infected with heart diseases and *Toxoplasma* with the group infected with heart diseases only, it was found that there were significant differences between the two groups, which confirms the effect of this parasite by changing the proportion of troponin by a large percentage, as the high troponin caused by *T. gondii* infection caused necrosis, damage and damage to the muscle This led to the secretion of troponin in quantities much higher than the natural limits, and this is the only explanation for the parasite's effect on changing the levels of troponin discovered so far.

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