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Evaluation of liver and kidney function in of pregnant women with chronic liver disease infected with toxoplasmosis in Misan Province

Mohammed R. Hassoon
Ministry of Health, Misan Health Department
mohammed782222@gmail.com
Qahtan Adnan Rasheed
College of health and medical technologies, Middle Technical University, Baghdad, Iraq
qahtan_albaytie69@yahoo.com
Mohammed Sh. Jebur
Department of medical laboratories, Al-Rafidian University College
mohammed.shamkhi@rur.edu.iq
https://orcid.org/0009-0000-5374-2110

Abstract

Objective: Toxoplasmosis represents one of the most widespread zoonosis parasitic disease caused by Toxoplasma gondii parasite, which is an intracellular protozoan. This disease infects all warm-blooded animals, including humans .

Aims of study: The current study aimed to assess the blood urea, creatinine, AST: aspartate aminotransferase; ALT: alanine aminotransferase and toxoplasmosis among pregnant women with chronic liver disease.

Materials and methods: The study was carried out during the period from October 2022 to the beginning of February 2023 with total number (200) pregnant women who attended to various governmental hospitals in Maysan Province-Iraq with their ages ranged from (19-35) years.

Results: The results showed 11(9.9 %) of women had positive IgM antibodies to toxoplasmosis, while 98 (49.5%) had positive IgG antibodies to toxoplasmosis. Co-infection was found in both T. gondii/HCV and T. gondii/ hepatitis B virus, (66.7% and 51.9 %) respectively. Women with chronic liver disease showed a significant increase of liver enzymes: aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in pregnant with toxoplasmosis compared women with no toxoplasma infection. Also a significant increase of Creatinine was found in infected women compared with women with no toxoplasma gondii infection.

Keywords: Toxoplasmosis, AST, ALT, Urea, Creatinine, Pregnant women

Introduction

The obligate intracellular parasite, Toxoplasma gondii, is protozoa with remarkable zoonotic significance, causing toxoplasmosis to human-beings and warm blooded animals [1].

Toxoplasmosis is an important global health disorder and considered as a health problem since it has effects on the well-being and health of human-beings, domestic animal, wildlife, livestock and ecosystem [2,3]. So toxoplasma is determined as nearly 1/3 of the humans have latent toxoplasmosis, with remarkable regional prevalence differences [4].

Cats, which are the final hosts play an essential role in toxoplasmosis distribution. Hence, bad hygienic managements of farms, climates, existence of cats in farms, ingestion raw or undercooked vegetables or meat as well as inter-current diseases could be potential risk factors affecting toxoplasma infection [5]. Patients with chronic liver disease (CLD) are often highly susceptible to opportunistic parasitic infections due to a depressed immune system [6]. Therefore, opportunistic toxoplasmosis can cause more frequent and severe effects in these patients and can change the course of the disease [7]. According to previous clinical and epidemiological studies, some reports highlighted a potential association between T. gondii infection and CLD, due to lack of information about the association of *Toxoplasma sp* infection and HCV and HBV infection in with chronic liver disease, this case-control study was performed to determine the seroprevalence of anti-T. gondii IgG and IgM levels in pregnant women infected with chronic liver disease [8].

Aspartate aminotransferase (AST), alanine aminotransferase (ALT), kidney and skeletal muscle and are more specific indicators of liver infection than ALT, which may be elevated in diseases affecting other organs. Cardiac muscle in myocardial infarction, except for acute hemolytic anemia, acute pancreatitis, severe burns, acute kidney disease, diseases of the musculoskeletal system and injuries.[9,10].

Urea and creatinine are good indicators of normal functioning kidneys and increased serum is an indication of kidney dysfunction [11]. Blood urea and serum creatinine are widely accepted and the most common parameters for assessing kidney functions [12]. The creatinine test diagnoses impaired kidney functions and measures the amount of creatinine phosphate in the blood [13].

The aim of study was assessing the blood urea, creatinine, AST: aspartate aminotransferase; ALT: alanine aminotransferase and toxoplasmosis among pregnant women with chronic liver disease.

Materials and methods

sample

Five ml of venous blood samples were collected from all pregnant women enrolled in this study. Blood samples were put in plain tubes for 15 minutes to clot, and then centrifuged for 10 minutes at 3000 rpm to obtain serum. Pregnant infected women were tested for the following: Toxoplasma IgG antibodies. according to the method of descriptive approach.

Study design

The study was carried out during the period from October 2022 to February 2023 on (200) pregnant women with their ages ranged from (19-35) years. Who attended to various governmental hospitals (Al-Shaheed Al-Sadr hospital and Maysan hospital for maternity and children) in Maysan Province-Iraq. To investigated the effect of toxoplasma gondii infection on pregnant women, serum toxoplasma IgG and IgM levels were detected and some liver and kidney function enzymes by Cobas e 801 system analyzer (ROChe) according to the method by [13]. patients were also

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investigated to chronic hepatitis C (HCV),chronic hepatitis B virus (HBV) Detection of Hepatitis Virus Markers Sera samples were also screened for hepatitis virus markers by enzyme-linked immunosorbent assays (ELISAs) using a hepatitis B surface antigen (HBsAg) assay for the detection of HBV, and anti-hepatitis C virus antibodies according to the method by [14]. for the detection of HCV. Toxoplasma IgM antibodies, serum urea, creatinine, GOT and GPT. The Cobas c311 system (ROChe) also done to estimate blood urea levels, while the Cobas c 311/501 system analyzer was used to estimate serum AST, ALP and creatinine levels.

Ethical approval

Before blood was drawn for this study, all subject provided written informed consent. Approval of this study by ethics committee of Al-Shaheed Al-Sadr hospital and Maysan hospital for maternity and children; under the date of 6/10/2022 .

Statistical analysis

The Statistical Analysis System (SPSS-26) program was used to detect the effect of different factors on the study parameters. T-test was expressed as percentage and mean ± standard deviation was used to compare between means. Chi-square test was used to compare between percentages and ($P \leq 0.05$and $P \leq 0.001$).

Results

Table (1) showed that a total out of (200) women, 11(9.9 %) had positive IgM antibodies to toxoplasmosis, while 100 (90.1 %) had negative IgM antibodies to toxoplasmosis, with non - significant difference (p=0.08). as shown that 89 women out of (200) women do not have antibodies to toxoplasmosis

Table1: Distribution the toxoplasmosis infection among pregnant women with the IgM antibodies

IgM	Study group		Total %	P value
	Toxoplasmosis (+ve)	Toxoplasmosis (-ve)		
Positive	11(9.9%)	100 (90.1%)	111 (100%)	Chi-sequare=0.04p-value=0.08 (NS)
Negative	89(100%)	0(0%)	89 (100%)	
Total	100	100	200	

Table2: Distribution the toxoplasmosis infection among pregnant women with the IgG antibodies

Table (2) showed that out of (200) pregnant women, 98 (49.5%) had positive IgG antibodies to toxoplasmosis, while 100 (50.5%) had negative IgG antibodies to toxoplasmosis, with a non-significant difference (p=0.1).

IgG	Study group		Total %	P value
	Toxoplasmosis	Toxoplasmosis)		

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	(+ve)	(-ve)		
Positive	**98(49.5%)**	**100(50.5%)**	**198(100%)**	**Chi-sequare=2.02 p-value=0.1 (N.S)**
Negative	**2(100%)**	**0 (0%)**	**2 (100.0%)**	
Total	**100**	**100**	**200**	

Table3: Percentage of *T. gondii* and hepatitis C (HCV) infection

Table (3) Regarding HCV, T. gondii infection was positive 18(66.7%) in pregnant women. While 91(52.6%) of pregnant women were negative to hepatitis C and T. gondii infection. There was no significant association between toxoplasmosis and HCV Infection (p = 0. 6).

Hepatitis C (HCV) status	**Study group**		**Total %**	**P value**
	Toxoplasmosis (+ve)	**Toxoplasmosis (-ve)**		
Positive (N.%)	**18(66.7%)**	**9(33.3%)**	**27(100%)**	**Chi-sequare=4.04 p-value=0.6 (NS)**
Negative (N.%)	**82(47.4%)**	**91(52.6%)**	**173(100%)**	
Total	**100**	**100**	**200**	

Table 4: Percentage of T. gondii infection and hepatitis B (HBV) infection

Table (4) revealed T. gondii infection in 14(51.9 %) of pregnant women studied. While 87(50.3%) of pregnant women were negative to hepatitis C and T. gondii infection. There was no significant association between toxoplasmosis and HCV Infection (p = 0. 8).

Hepatitis B (HBV) status	**Study group**		**Total %**	**P value**
	Toxoplasmosis (+ve)	**Toxoplasmosis (-ve)**		
Positive (N.%)	**14(51.9%)**	**13(48.1%)**	**27(100%)**	**Chi-sequare=4.06 p-value=0.8 (NS)**
Negative (N.%)	**86(49.7%)**	**87(50.3%)**	**173(100%)**	
Total	**100**	**100**	**200**	

Table 5: Mean and standard deviation of liver enzymes AST , ALT in CLD women infected with *T. gondii*

The results showed a significant increase of liver enzymes: AST and ALT in the sera positive toxoplasmosis pregnant women. Liver enzyme levels were within a normal range in pregnant women without *T. gondii* infection, while they were increased in toxoplasma infected pregnant women. Highly significant increase of the liver enzymes in the serum of positive toxoplasmosis in both patients and controls compared with negative toxoplasmosis subjects (p < 0.001).

Test	**HCV (Positive)**	**P value**

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	Toxoplasmosis (+ve) (n=18)	Toxoplasmosis (-ve) (n=9)	
	M±S.td	M±S.td	
AST (U/L)	44.38±12.38	21.88±13.92*	≤ 0.001 (HS)
ALT (U/L)	39.83±3.21	18.73±7.57*	≤ 0.001 (HS)

Table 6: Mean and standard deviation of kidney function in CLD women infected with *T. gondii* infection

The results showed a significant increase of Urea in the sera positive toxoplasmosis patients compared with negative patients. Also a significant increase of the serum Creatinine in positive toxoplasmosis in both patients compared with negative toxoplasmosis subjects ($p < 0.04$).

Test	HCV(positive)		P value
	Toxoplasmosis(+ve) (n=18)	Toxoplasmosis(-ve) (n=9)	
	M±S.td	M±S.td	
Urea (mg/dl)	19.16±4.07	21.75±8.86	0.3 (NS)
Creatinine (mg/dl)	0.47±0.08	0.6±0.22*	0.04 (S)

Discussion

Patients with chronic liver disease are liable to a wide spectrum of bacterial, viral, and parasitic infections [15]. Viral hepatitis represents one of the most common etiologies of liver disease. In the present study ,In the current study, the results showed that the number and percentage of pregnant women with toxoplasmosis who had positive IgG-toxoplasma antibodies was higher than the number and percentage of pregnant women with toxoplasmosis who had positive IgM-toxoplasma antibodies .Clinical diagnosis of toxoplasmosis involves serologic detection of IgM and IgG antibodies. The IgM antibody detection confirms acute infection, while IgG antibody detection confirms acute or chronic infections [13]. Since infection of pregnant women is often asymptomatic, screening and detection of toxoplasmosis during pregnancy depends upon serological methods. Though detections of both T. gondii-specific IgG and IgM in a single serum specimen should indicate acute infection, we must not exclude previous infections since T. gondii-specific IgM antibodies can remain for months or years following infections [14].

Results of recent study agreed with an Indian study, which revealed that the seroprevalences of toxoplasma IgM & IgG in Indian pregnant women recorded 45% and 3.3% respectively [15], and also agreed with a study which showed that among Turkish pregnant women, the seropositive toxoplasma IgG and IgM was 60.4% and 3.0% respectively [16]. The high level of anti-T. gondii IgG levels in toxoplasma patients might be attributed to the decline in humoral and cell-mediated immune responses among chronically-infected individuals because of later latent infection reactivations [17]. However, these results disagreed with the findings of [18] in Kut province/Iraq, who found a higher rate of toxoplasma IgM antibodies among pregnant women than IgG on using the ELISA technique. The major diagnostic problem in pregnant women is the long-term IgM antibodies, however, T. gondii-specific IgM antibodies do not necessarily suggest acute infections [19]. In several cases, diagnosis of acute and latent toxoplasmosis depends upon T. gondii-specific IgG and IgM antibody detection [20]. Patients with chronic liver disease are liable to a wide spectrum of bacterial, viral, and parasitic infections [13]. Viral hepatitis represents one of the most common etiologies of liver disease in Egypt. In the present study, HCV was found to be a major

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cause among Egyptian patients with CLD (77.1%); for HBV, 4.3%. [21]. Experimental studies observed the presence of tachyzoites and tissue cysts inside the hepatocytes and within the sinusoidal liver capillaries. When such a parasite invades the hepatocyte, it can lead to disturbances in its metabolic activity, shape distortion, and damage in its DNA [20,21]. It is known that the parasite locates the host liver and causes pathological changes that progress to hepatomegaly, granuloma, hepatitis, and necrosis [22]. Serum AST and ALT activities are excellent markers of hepatocellular injury. Normally, these enzymes are present in the liver and other tissues where they function in energy metabolism involving the transamination of amino acids. However, in cases of cellular damage, AST and ALT could leak out into the general circulation leading to elevated activity [23]. Hepatic injury is a well-established complication of toxoplasmosis, as this infection can cause round cell infiltration in the portal areas, cholestasis, swollen endothelial cells, and focal necrosis of liver cells [24]. Moreover, protein fractions of AST and ALT varied according to the intensity of inflammation induced by Toxoplasma infection. In this study, there was a significant elevation in the level of liver enzymes in Toxoplasma positive patients compared with Toxoplasma negative patients in agreement with the findings of Limdi and Hyde [25] , Mahmood and Dawood [26]. Moreover, serum ALP activity was significantly higher in Toxoplasma positive patients than that in Toxoplasma negative patients. This finding could be explained by the presence of T. gondii in the bile duct cells, since hepatic ALP is reported to be present on the canalicular and luminal domain on the bile duct epithelium [27].

Specific liver enzymes were shown to continue elevation following toxoplasmosis, which can be associated with the degree of hepatic damages [24]. Indeed, a study done by [28] revealed that the alteration in serum GOT and GPT levels may be related to the severity of inflammation caused by toxoplasma strains and hosts [29]. In addition, it is well established that infection with toxoplasmosis can cause round cell infiltration in the portal areas, cholestasis, swollen endothelial cells and focal necrosis of liver cells It has found that the changes of protein fractions, GOT and GPT varied according to the qualitative difference in intensity of inflammation by strains of toxoplasma and host [30].

In addition, results of study revealed that there was a highly significant difference in urea and creatinine levels between the high IgG levels in aborted women infected with toxoplasmosis.

These results coincided with the findings of [31] , who found an increased levels of serum urea and creatinine in pregnant women infected with toxoplasma, and attributed it to toxoplasma tachyzoite that invades and replicates in the kidney causing renal damage and leading to low urea and creatinine excretion form the body, thus their serum levels will be elevated.

It was found that toxoplasmosis has a tropism to the kidney. The huge number of the parasite in the kidneys may be related to kidney functions and glomerular filtrations [32]. The exposure to T. gondii might result in chronic or acute renal damages, initiating injury, which could influence the exposures during their life. Previous studies revealed a relationship between dialysis and an elevated rate of toxoplasmosis.

The elevation in the urea concentration might be due to Toxoplasma deleterious effects on the kidney which decrease the excretion of urea from the body and subsequently increased its serum levels [35].

Conclusions

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study found (9.9%) of women had positive IgM antibodies to toxoplasmosis, while (49.5%) had positive IgG antibodies to toxoplasmosis, Co-infection were documented in both T. gondii/HCV and T. gondii/ HBV (66.7% and 51.9), Women with chronic liver disease showed a significant increase of liver enzymes: AST, ALT, in the women with toxoplasmosis compared with negative patients,. a significant increase of Creatinine in the sera of positive toxoplasmosis patients compared with negative patients.

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