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Study the potential association between Toxoplasma gondii , HBV and HCV in tuberculous patients

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دراسة العلاقة المحتملة بين طفيلي التوكسوبلازما وفيروس التهاب الكبد B وفيروس التهاب الكبد C لدى مرضى السل

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الخلاصة

اثنين من الكائنات الحية الدقيقة المعدية اجبارية المعيشة داخل الخلايا وتشمل التوكسوبلازما جوندي و Mycobacterium tuberculosis. الميكروب التوكسوبلازما جوندي هو مصدر مرض طفيلي داء المقوسات، في حين أن فيروسات التهاب الكبد B و C هي عدوى فيروسية معروفة بقدرتها على إتلاف الكبد. فيروسات التهاب الكبد B و C هي أساس النوع الشديد من مرض التهاب الكبد.إن أهداف الدراسة الحالية هي التحقيق في عدوى التوكسوبلازما وفيروس التهاب الكبد B و C بالإضافة إلى تحديد أي ارتباط محتمل بين الاثنين في مرضى السل مقارنة بمن هم أصحاء ظاهريًا. المنهجية: هذه دراسة حالة وشاهد. أجريت بين يوليو ٢٠٢٢ وفبراير ٢٠٢٣ في مركز أمراض الصدر والجهاز التنفسي التخصصي في بغداد في ظل ظروف معقمة تمامًا. تم أخذ العينات من مائة مريض بالسل ومجموعة ضابطة. يعتمد التعرف على مضادات التوكسوبلازما IgG ومضادات فيروس التهاب الكبد B (HCV وHBV) في مصل الدم عن طريق استخدام تقنية ELISA لمجموعة اختبار الأجسام المضادة لـ IgG من فصيلة المقوسات Toxoplasma وتوصلت نتائج الدراسة الحالية إلى أن نسبة حدوث الأجسام المضادة لـ IgG من فصيلة المقوسات بين مرضى السل ومجموعة الضبط كانت (٥٨٪) و(١٦٪) على التوالي. وتشير قيمة P=0.0006 إلى وجود فرق ذي دلالة إحصائية في قياس الإصابة بطفيلي المقوسات Toxoplasma بين مرضى السل ومجموعة الضبط. وأظهر البحث في المقابل أن المجموعة الضابطة ١ (٢٪) و٧ (١٤٪) و٥ (١٠٪) من مرضى السل كانت إيجابية لفيروس التهاب الكبد B وفيروس التهاب الكبد C على التوالي. وعند مقارنة مرضى السل والمجموعة الضابطة، تبين أن هناك فرقًا معنويًا (P<0.01) بين T.gondii/HBV و T.gondii/HCV بنسبة ٢٨.٥٪ و٦٠٪ على التوالي .

Abstract

Two obligatory intracellular infectious microorganisms include Toxoplasma gondii and Mycobacterium tuberculosis. The microbe T. gondii is the source of the parasitic disease Toxoplasmosis, whereas hepatitis B and C viruses are a viral infection known for its ability to damage the liver. The hepatitis B and hepatitis C viruses are the foundation of the severe type of hepatitis disease .The current study's objectives are to investigate the toxoplasma and hepatitis B and C virus (hepatitis B and hepatitis C viruses) infection in addition to identify any possible correlation between the two in TB patients compared to those who apparently healthy. Methodology: This is a case-control study. It was conducted between July 2022 and February 2023 at the Chest and Respiratory Disease Specialized Center in Baghdad under fully aseptic circumstances. Samples were taken from a hundred tuberculosis patients and a control group. The recognition depends on Anti-Toxoplasma IgG and Anti -hepatitis B virus (HCV and HBV) in their serums via using Toxoplasma IgG enzyme-linked immunosorbent assay kit ELISA technique. The current study's findings conclude that the occurrence of anti-toxoplasma IgG among tuberculosis patients and control group was (58%) and(16%), respectively. P=0.0006 indicates a statistically significant difference in the measurement of Toxoplasma infection in the middle of tuberculosis patients and control group. The research showed that, in contrast control group 1 (2%), 7 (14%) and 5 (10%) of TB patients tested positive for HBV and HCV, respectively. When comparing TB patients and the control group, it was demonstrated that there was a significant difference (P<0.01) between T. gondii/HBV and T. gondii/HCV of 28.5% and 60%, respectively.Keywords: Toxoplasma, hepatitis B virus (HBV),hepatitis C virus (HCV) TB patients.

١. Introduction

Tuberculosis and toxoplasmosis are advancing intracellular infectious diseases[Parsaei, Mahdi, et al.,2022]. One-third of the world's population suffers from tuberculosis, a disease caused by the obligatory intracellular acid-alcohol-fast bacillus Mycobacterium tuberculosis. People who have the pulmonary type of the bacillus, which attacks the lungs and can also damage other parts of the body, can spread the infection by inhaling droplets from their cough, speech, or sneeze. The single-celled intracellular protozoan that causes toxoplasmosis is a zoonotic disease that afflicts 30% of the world's population. Toxoplasma gondii, Both domestic and wild cats are thought to be the definitive hosts because they release environmentally resistant oocysts in their feces that contaminate soil, water, and food. Eating food infected by bradyzoites or tachyzoites might result in infection. Toxoplasma gondii frequently causes neonatal infections in immunocompetent people, retinochoroiditis, a mononucleosis-like condition, or asymptomatic infections [Mathema et al., 2015 , Dubey et al.,2008]. In locations where TB and parasitic diseases are co-endemic in underdeveloped nations, co-infection of humans is a significant public health concern. Nevertheless, research on co-infection is scarce, and reviews are even scarcer [Li, Xin-Xu, and Xiao-Nong Zhou, 2013 , Zhao et al.,2017].An inflammation of the liver cells is known as hepatitis, and most often brought on by viruses that cause hepatitis. The A, B, C, D, and E viruses that responsible for damage to the hepatocyte are to blame. The hepatitis B and hepatitis C viruses are the cause of the severe type of hepatitis. Viral hepatitis B and C infections can cause serious health issues. [Yousfani et al., 2006]. Worldwide, especially in poorer nations, hepatitis B and C viruses are causing severe liver damage and are the cause of a rise in morbidity and death. [Israr et al.,2021 , Khokhar, and Saima A. Niazi ,2003]. Infection with HBV and HCV is a frequent cause of chronic liver disease and is frequently seen in communities where TB infection is a possibility.[Lee et al ., 2005].Co-infections may make patients stronger or more susceptible to another pathogen, leading to a heightened awareness of the possibility of co-infections with Toxoplasma and TB [Lee et al ., 2005, Li, Xin-Xu, and Xiao-Nong Zhou, 2013], hepatitis C and hepatitis B virus and other illnesses, suggesting that tuberculosis may be the cause of immunosuppression and the catalyst for the development of opportunistic infections. [Getie et al., 2021]. The current study's objectives are to investigate the toxoplasma , hepatitis B and C viruses (HCV and HBV) infections and to identify any possible correlation between the two in TB patients compared to those who are apparently healthy.Materials and methods This is case-control study. It was conducted between July 2022 and February 2023 at the Chest and Respiratory Disease Specialized Center in Baghdad under fully aseptic circumstances. Eight milliliters of venous blood samples were taken from hundred TB female and male patients and a control group. The tubes used to collect the blood samples were utilized for serum separation to detect antibodies against hepatitis and toxoplasma (HBV/HCV). By using an enzyme-linked immunosorbent test (ELISA) (Hepatitis ELISA Kit, Mybiosource, USA, and Toxoplasma ELISAKit, Calbiotech) in accordance with the manufacturer's instructions, specific antibodies (IgG) against Toxoplasma and Hepatitis (HBV/HCV) were found and quantified[Muhsin SS et al., 2018 ,Ledru et al., 1995].Results AND Discussion Intracellular obligatory infectious bacteria are Toxoplasma gondii and Mycobacterium tuberculosis that cause 30–50% of the global

population to contract toxoplasmosis, 9.0–11.1 million people to have tuberculosis sickness in 2017, and 23% to have a latent tuberculosis infection [Flegr et al., 2014, WHO , 2013].The greater occurrence of toxoplasma in TB patients when compared to controls is summarized in Table 1. It was discovered that, in comparison to the healthy control group, (29) 58% of the tuberculosis patients tested positive for toxoplasma (Table 1). Toxoplasmosis disease has been found to be highly prevalent in a number of nations due to lifestyle factors ,while prior Iraqi investigations revealed that a sizable fraction of individuals infected were in the healthy control group (57.1% and 42.5% correspondingly), anti-Toxoplasma IgG antibodies were only identified in

Group	Toxoplasmosis (29)		P-value
	HCV Present	**HCV Absent**	
Tuberculosis with Hepatitis C virus (5)	3 (60%)	2 (40%)	0.64(NS)
healthy control	0 (0.00%)	0 (0.00%)	NS
P-value	**0.01	**0.01	---
**: Highly Significant, NS: Non-Significant.			

16% of the healthy control group [Ashkani-Esfahani et al.,2017 ,Montazeri et al., 2017, Solomos et al.,2021 , Rathnayake, Deepani et al., 2010].Hepatitis caused by viruses is a major worldwide health concern. Compared to underdeveloped countries, prevalence rates are significantly greater in developing and impoverished nations[Vazhavandal et al., 2014]. Table 2 showed that, in contrast to control group 1 (2%), 7 (14%) and 5 (10%) of TB patients tested positive for HBV and HCV, respectively. Nevertheless, this connection did not reach a statistically significant level. Reis NR et al. [Reis et al.,2011] reported HCV (7.5%) results that were almost identical.While in Thailand, a research found that the frequency of HCV (31%), and HBsAg (9%) was quite high. [Sirinak et al.,2006]. According to a Georgia study by Richards et al., 22% of participants tested positive for HCV. [Buziashvili et al.,2024]. Kuniholm et al reported a positivity rate of 4.3% for HBsAg and 12% for HCV [Sirinak et al.,2006]. In a study by Khalil et al, it was found that 8 out of 102 tuberculosis patients (7.84%) were co-infected with HBV, while 28 out of 102 tuberculosis patients (27.45%) were co-infected with HCV [Naqvi et al.,2015]. The different outcomes might stem from the utilization of various methods such as ELISA, PCR, and recombinant immunoblot assay (RIBA Table1: Variations in the toxoplasma infection rate between the patients and the control group

Studied groups	N	***Toxoplasmosis*** Positive IgG
Patients	50	29 (58%)
healthy (Control)	50	8 (16%)
Chi-Square	---	3.428
P-value	---	0.0006
Odd Ratio: OR	---	4.9113
95 % CI:		1.9770 to 12.2009

Table 2: Distribution of hepatitis (HBV/ HCV) in patients and control

Group	No. of serum samples	HBV positive IgG (%)	HCV positive IgG(%)
Patients	50	7 (14%)	5 (10%)
Control	50	1 (2%)	0 (0.00%)
Chi-Square	---	1.906	1.678
P-value	---	0.05	0.09(NS)
Odd Ratio: OR	---	7.9767	12.208

95 % CI:	----	0.94 to 67.46	0.66 to 226.98
** (P<0.01), NS: Non-Significant.			

When comparing TB patients with the control group, Table 3 demonstrated a significant difference (P<0.01) between T. gondii and HCV. The hazard of co-infection, that is, T. gondii/HCV and T. gondii/HBV , was found to be 33.3% and 31.4%, respectively, in Egypt, according to a study [Getie et al., 2021,].

Table3: Association between Toxoplasma, HCV among Tuberculosis patients

When comparing TB patients and the control group, Table 4 demonstrated that difference btween HBV and T. gondii was statistically significant (P<0.01). Meanwhile, a study conducted in Pakistan found that the hazard of co-infection, or T. gondii/HBV and T. gondii/HCV, was 5.5% and 10%, respectively [Bazmjoo et al., 2023], numerous researchers have noted that co-infections significantly suppress host immunity because of the previously mentioned numerous factors that cause tuberculosis (TB) to co-occur with other diseases in humans [Hunter et al.,2008].Table4: Association between Toxoplasma, HBV among Tuberculosis patients

Group	Toxoplasmosis (29)		P-value
	HBV Present	**HBV Absent**	
Tuberculosis with Hepatitis B virus (7)	2 (28.5%)	5 (71.4%)	0.05
healthy control	0 (0.00%)	0 (0.00%)	NS
P-value	**0.01	**0.01	---
**: Highly Significant, NS: Non-Significant.			

CONCLUSION

The current investigation shows that, in contrast to the healthy control group, the occurrence of anti-toxoplasma IgG between TB patients was significant. Specifically, among TB patients, hepatitis B virus infection was present in 7 (14%).In the middle of patients with tuberculosis, the prevalence of hepatitis C virus infection was five percent. When comparing TB patients to the control group, there was a correlation between T. gondii/HBV and T. gondii/HCV; however, more research is required to determine the mechanism underlying this correlation.

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