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Serological Detection of Parvovirus B19 in Thalassemia Patients in Thi Qar City

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Annotation: The parvovirus B-19 is a tiny, unwrapped, single-strand DNA virus which has an icosahedral capsid of 18–26 nm. A blood transfusion and airborne droplets can spread and induce a variety of illnesses, including fetal hydrops, arthropathy, contagious erythema, and transient aplastic crises. Through the serological detection of particular anti-Parvovirus B19 IgM and IgG in the patients' sera, this case control research seeks to identify Parvovirus B19 in the pathophysiology and complications of beta thalassemia major. 120 patients each had blood samples taken for serology in order to identify a particular anti-Parvovirus B19 antibody using ELISA. In contrast to a control group that had negative findings for both IgM and IgG, the serological data showed that 2 (1.7%) and 37 (30.8%) of the beta thalassemia major were positive for IgM and IgG antibodies specific for Parvovirus B19, respectively. According to statistical analysis, there was no significant difference (P=0.497) in the detection of anti-Parvovirus B19 IgM antibody between the patients and control, however there was a large significant difference (P<0.001) regarding anti-Parvovirus B19 IgG antibody. In conclusion,

the identification of antibodies in thalassemia patients may suggest that this virus contributes to thalassemia patients' exacerbations.

Introduction

Mutations in the α-globin (chromosome 16) or β-globin (chromosome 11) genes cause thalassemia, a genetic condition in which the afflicted globin chain is lost while the unaffected one accumulates, resulting in an excess of the globin chain. As a result, hemolytic anemia or disarray may increase due to insufficient erythropoiesis, erythroid membrane injury, and spleen blockage (Li, 2017). According to (Daraghmeh ,2016). the word "thalassemia" comes from the Greek word "thalassa," which means "sea" and "blood." Hemoglobinopathy, the term used to describe thalassemia, is a disease that results from a lack of hemoglobin protein in red blood cells (RBCs). More precisely, gene mutations encoding the alpha and beta globin chains that comprise hemoglobin's quaternary structure are the cause of alpha and beta thalassemia (Talwar, 2016). With an icosahedral capsid of 18–26 nm, Parvovirus B19 is a tiny, unwrapped, single-strand DNA virus. The 60 structural viral proteins (VP) that make up the capsid are divided into two types: the big structural protein VP2, which makes up the majority of the capsid composition, and the minor structural protein VP1, which makes up around 5% of the capsid (Adamson ,2013).. There are roughly 5.596 nucleotides in the Parvovirus B19 genome (Palinski, 2016). Predominantly, respiratory droplets, blood or blood transfusions, or maternal infection are the means by which parvovirus B19 is spread (Soliman et al., 2013; Shabani et al., 2015). Infections with parvovirus B19 have also been documented in children with congenital coagulation abnormalities, patients with multitransfusion-associated hemophilia, and recipients of Factor VIII concentrates. (Satake et al., 2011). By attaching to glycosphingolipid globoside (Gb4), parvovirus B19 targets erythroid progenitors in the bone marrow. This causes structural alterations in the receptor that lead to lysis or non-structural (NS1) protein-mediated apoptosis, which results in cell death (Rogo et al., 2014). Parvovirus B19 attacks the actively proliferating erythroid progenitor cells in the human liver and bone marrow, resulting in erythrocytopenia and a decrease in erythrocyte synthesis. (Sharaf, 2017). According to (Zavattoni et al. 2016), human parvovirus B19 infections are frequent and ubiquitous. Depending on the patient's hematological and immunological condition, infections can cause a variety of clinical symptoms. In immunocompromised patients, the main symptoms are hydrops fetalis or intrauterine mortality in infected fetuses and chronic viremia with or without anemia. In immunocompetent individuals, the Parvovirus B19 infection may be benign or silent, resulting in arthropathy and erythema infectiosum (Svetoslav et al., 2016). Serious clinical diseases are a risk for patients with blood abnormalities, especially those with chronic hemolytic anemia like thalassemia. The rate of erythroid progenitor cell production rises in these patients to offset red blood cell lysis. Parvovirus B19 infection can cause acute erythroblastopenia, also known as a transitory aplastic crisis, by suppressing erythropoiesis. Only thalassemia patients experience this brief halt in red blood cell formation because of their shortened red blood cell lifespan. The risk of Parvovirus B19 transmission rises in these patients. *(Obeid, 2011).*

Materials and Methods

Study Participants: Patients At the Hereditary Blood Diseases Center in Al Nasiryah City, 120 patients with beta thalassemia major are included in the current study; 67 of them are male and 53 are female. These patients were chosen between September and December of 2019. Hematological parameters and HPLC tests conducted at that center's Control Group confirm that every patient has thalassemia. 50 healthy participants were divided into two groups for this study 27 males and 23

females. Hematological parameters were detected, and HPLC was used to rule out any suspected cases of thalassemia, anemia, or sickle cell anemia. Collection of Blood Specimens Both patients and controls had three milliliters of venous blood drawn. Blood samples were obtained in a gel tube for serum separation, which was utilized for ELISA Serological Diagnosis (ELISA Indirect Test) to diagnose anti-Parvovirus B19 IgM and IgG antibodies. Anti-Parvovirus B19 IgM and IgG were detected using an ELISA washer and reader made by Biotec in the USA.

Ethical Acceptance This study was conducted in accordance with the guidelines established by the Iraqi Ministry of Health and subject to ethical concerns.

Statistical Analysis

This case-control study was statistically analyzed using Microsoft Excel 2013 and the Statistical Package for the Social Sciences (SPSS) 20.0. Numerical data with a normal distribution were used to compare the two groups using the independent sample t-test, standard deviation, mean, and median. The proportion and count were classified as category data. The relationship between the variables was estimated using the Fisher test. Statistically significant differences are recognized at lower and higher levels. The lower level is less than 0.05, and the higher level is less than or equal to 0.01.

Results of Serological:

Anti-Parvovirus B19 IgM Antibody Detection According to the results of the ELISA test for anti-Parvovirus B19 IgM, two patients (1.7%) had anti-Parvovirus B19 IgM antibodies, whereas all controls (0.00%) had negative results. Fisher's test, however, indicates that there was no statistically significant difference between the patient and control groups (p=0.497). in the identification of IgM antibodies against Parvovirus B19. Conversely, the relative risk value of 1.424 indicated a significant correlation between the role of anti-Parvovirus B19 in thalassemia patients and the presence of anti-Parvovirus B19 IgM antibody. Table 1.Table 1:Serological Detection of Anti-Parvovirus B19 IgG Antibodies in Thalassemia Patients and Controls

IgM	Study group	
	Patient No.	Control No.
Positive	2	0
	1.7%.	0.0%.
Negative	118	50
	98.2%.	100.0%.
Total	120	50
	100.0%.	100.0%.
P value	0.497	
RR (CI)	1.424	

Identification of IgG Antibody Against Parvovirus B19 The findings showed that the percentage of anti-Parvovirus B19 IgG antibody in the 37 thalassemia patients (30.8%) decreased when compared to the control group's full percentage of 0.0%. This suggests that there is a highly significant difference between the patients and control group in terms of anti-Parvovirus B19 IgG antibodies presence (P<0.01) the following table 2.Table 2:Serological Detection of Anti-Parvovirus B19 IgG Antibodies in Thalassemia Patients and Controls

IgG	Study group	
	Patient	Control
Positive	37	0
	30.8% .	0.0%.
Negative	83	50
	69.2% .	100.0%.
Total	120	50

	100.0%.	100.0%.
P value	<0.01**	

Discussion:

Serological Level. Anti-Parvovirus B19 IgM detection According to the study, thalassemia patients' serum had a low percentage of positive anti-Parvovirus B19 IgM antibodies (1.7%), while control samples had negative levels (0.0%). The patients and control group did not differ statistically significantly (p = 0.497). A study in Iraq's Kurdistan region revealed that 3.7% of thalassemia patients had antiParvovirus B19 IgM antibodies, which was extremely similar to the findings of this investigation. (Khorang et al. 2017). However, a study conducted in the central Iraqi city of Al-Hilla revealed that individuals with thalassemia major had a comparatively high percentage (13%) of anti-Parvovirus B19 IgM antibody (Tarish, 2013). A study conducted in Tunisia revealed that patients with thalassemia major had negative anti-Parvovirus B19 IgM antibody findings. (Regaya et al., 2007). The number of days in which anti-Parvovirus B19 IgM antibody can be found may be the reason for the low percentage of this antibody in our investigation. The anti-Parvovirus B19 IgM antibody is evident on the fifth day of infection and reaches its peak titer on day 15. After 40 days of infection, the antibody begins to wane and eventually disappears. Anti-Parvovirus B19 IgM antibody detection suggested an acute or recent infection. Usually asymptomatic, an acute Parvovirus B19 infection might cause influenza-like symptoms. In situations that are otherwise asymptomatic, transitory anemia is also linked to the death of erythrocyte progenitor cells. Aplastic crises are more likely to occur in patients with reduced red blood cell half-lives brought on by underlying hematologic diseases, such as sickle-cell anemia, Fanconi anemia, or thalassemia (Plentz and Modrow, 2011Anti-Parvovirus B19 IgG detection In contrast to the control finding of 0.0%, the study indicated that thalassemia patients had a high percentage of positive anti-Parvovirus B19 IgG antibodies in their serum (30.8%). Although these figures may differ significantly by nation, statistically speaking, there was a highly significant difference between the patients and the control group (Heegaard and Brown, 2002). Anti-Parvovirus B19 IgG antibody detection has two sides: on the one hand, it can reveal the duration and type of the infection, which may be past or ongoing, and on the other, it can reveal a later form of infection that causes pure red cell aplasia and severe chronic anemia. (Plentz and Modrow, 2011). However, since the presence of this antibody suggests that the patient is protected from the virus, it also reveals the intensity of the immune response to Parvovirus B19 infection. The patient who did not test positive for these antibodies, however, might have a weakened immune system that prevented him from being protected from the virus. At the same time, the Chapter Five Discussion 56 presence of this specific type of antibody suggests that the infection has either progressed or is still present.

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