ISSN: 2520-5234

*Available online at* http://www.sjomr.org

SCIENTIFIC JOURNAL
OF MEDICAL RESEARCH

Vol. 5, Issue 17, pp 25 – 28 , 2021

ORIGINAL ARTICLE

# Seroprevalence of Human Parvovirus B19 Antibodies in Patients With Hemoglobinopathies in Basrah Province-Iraq

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**ARTICLE INFORMATIONS**

**Article History:**
Submitted: 3 December 2020
Revised version received:
28 January 2021
Accepted: 12 February 2021
Published online: 1 March 2021

**Key words:**
Human Parvovirus B19V
Thalassemia
Sickle cell

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**ABSTRACT**

**Objectives:** Human Parvovirus B19 infects human and cause no or mild disease, but more severe disease may occur in some people especially those with thalassemia and sickle cell anemia. In BV19 infections lead to suppression of the erythrocytes formation and acute erythroblastopenia often called transient aplasia crisis which may be life-threatening. The aim of this study was to detect the prevalence of Human parvovirus B19 antibodies in thalassemia and sickle cell patients in Basrah Province, Iraq.

**Methods:** A 208 serum samples of both sexes with the age range 1 to 47 years' old were collected from patients with haemoglobinopathies. All serum samples were performed by using ELISA kits.

**Results:** Human parvovirus B19V IgG was detected in patient groups 186/208(89.4%), B19V IgM 20/208(9.6%) and B19V IgG 77/100(77%), B19V IgM 8/100(8%) of control groups. The studied patients were divided into 10 age groups, the age periods (1-5) and (10-15) were significantly prone to the infection ($P< 0.05$). In contrast, the age period (46-50) years had significantly lower infection ($P< 0.05$). Also, the patients were divided into 5 study groups.

**Conclusion:** We concluded that high seroprevalence of anti-B19V IgG in thalassemia and sickle cell patients.



**Citation:** **Al Atbee M.A.K., Al Hmudi H.A.** and **Al Salait S.K.A.** "Seroprevalence of Human Parvovirus B19 Antibodies in Patients With Hemoglobinopathies in Basrah Province-Iraq". Sci. J. Med. Res. 2021; 5 (17): 25- 28.

## INTRODUCTION

Beta-thalassemia refers to group of genetic blood disorders in which there is quantitative imperfection in beta chain creation of ordinary hemoglobin (Hb) molecules, bringing about a range of anemias varying in severity [1,2]. It is considered one of the most genuine medical issues around the world, representing a significant number of child passing every year [3,4].

Sickle cell disease (SCD) is a hereditary blood disease which is because of the presence of an irregular type of hemoglobin, hemoglobin S, which precipitates under low oxygen tension and results in the cell expecting the shape of a sickle [5] SCA is associated with high morbidity and mortality among sickle cell suffers in developing countries[6].

Human Parvovirus B19 (B19V), the virus answerable for the *erythema infectiosum*, was discovered within the U.K. in 1975 by means of COSSART *et al.*, who recognized the virus in the serum of a healthful blood donor [7]. It is the only pathogenic human virus belonging to the *Parvoviridae* family and having, worldwide distribution [8].

Human parvovirus B19 is a single stranded DNA virus inside the genus erythrovirus of the family *Parvoviridae*. B19V has a huge range of clinical appearances and diagnosis is fundamentally done by the detection of B19V specific IgM antibodies or B19V DNA [9].

B19V infection generally causes erythema infectiosum, arthralgia, fetal death, transient aplastic crisis in patients with shortened red cell survival, and persistent infection in immunocompromised persons. Less common clinical manifestations include atypical skin rashes, neurological syndromes, cardiac syndromes, and various cytopenia resulting from infection of bone marrow [10,11]. In immunosuppressed patients, B19 infection may persist and lead to pure red cell aplasia, chronic anemia, and less frequently thrombocytopenia, pancytopenia, and neutropenia [15]. The aim of this study was to detect the prevalence of Human parvovirus B19 antibodies in thalassemia and sickle cell patients in Basrah province, Iraq.

## MATERIALS AND METHODS

**Patients and samples:** A 208 serum samples of both sexes with the age range 1 to 47 years' old were collected from patients with haemoglobinopathies that obtained from Basrah Center for Hereditary Blood Diseases (BCHBD) and premarital clinic in Al-Sadr teaching hospital during the period between March to December, 2018. Furthermore, 100 individuals as control group, 49 of them are males and 51 females with age range 1 to 47 years. All the samples were stored at -40 $^{0}$C until used.

**Serological tests by ELISA assay:** All serum samples were examined to detect anti-Parvovirus antibodies including anti-Parvovirus IgG and anti-Parvovirus IgM. Determination was performed by using ELISA kits (EUROIMMUN kit, Germany) according to the manufacturers' instructions.

**Statistical analysis**: Analysis of the data obtained was made by using SSPS software version SPSS 24. *P* values <0.05 were considered statistically significant.

## RESULTS

**Patient's characteristics:** A total of 208 patients with the age range 1 to 47 years old and 92 (44.2%) males and 116 (55.8%) females were included; 127 (61%) Sickle cell patients, 51 (24.5%) Thalassemia patients and 30 (14.5%) Sickle -Thalassemia patients. Also, the patients were divided into 5 studied groups (Table 1) gives up the follows percentages [No, %]: Sickle cell trait SA [88, 42.3%; 52(59.1%) females and 36(40.9%) males], Sickle cell anemia SS [39, 18.8%; 24(61.5%) females and 15(7.21%) males], Thalassemia Trait TT [45, 21%;25(55.6%) females and 20(44.4%) males], Sickle-Thalassemia ST [30 , 14.42%; 14(46.7%) females and 16(53.3%) males] and Thalassemia Major TM [6, 2.88%;1(16.7%) females and 5(83.3%) males], In addition to control group [100; 51(51%) females and 49(49%) males].

The studied patients were divided into 10 age groups (Table 2), the age periods (6-10) and (11-15) were more numerous (P< 0.05) than others periods. In contrast, the age period (46-50) years was less numerous.

Table 1: **Studied groups and sex distribution of subject.**

| Studied groups | Female No. (%) | Male No. (%) | Total No. (%) |
|---|---|---|---|
| **SA** | 52 (59.1) | 36 (40.9) | 88 (42.3) |
| **SS** | 24 (61.5) | 15 (38.5) | 39 (18.8) |
| **ST** | 14 (46.7) | 16 (53.3) | 30 (14.4) |
| **TM** | 1 (16.7) | 5 (83.3) | 6 (2.9) |
| **TT** | 25 (55.5) | 20 (44.5) | 45 (21.6) |
| **Total** | 116 (55.8) | 92 (44.2) | 208 (100) |
| **P-value** | 0.01 | 0.01 | 0.01 |

Table 2: **Age and sex distribution of subjects**.

| Age groups | Patients No. (%) | Control No. (%) | Total No. (%) | P. Value |
|---|---|---|---|---|
| **1-5** | 35(16.8) | 17(17) | 52(16.9) | |
| **6-10** | 64(30.8) | 31(31) | 95(30.9) | |
| **11-15** | 40(19.2) | 20(20) | 60(19.5) | |
| **16 -20** | 25(12) | 12(12) | 37(12) | |
| **21-25** | 20(9.6) | 9(9) | 29(9.4) | **0.979** |
| **26-30** | 7(3.4) | 3(3) | 10(3.2) | |
| **31-35** | 7(3.4) | 3(3) | 10(3.2) | |
| **36-40** | 5(2.4) | 2(2) | 7(2.3) | |
| **41-45** | 4(1.9) | 2(2) | 6(2) | |
| **46-50** | 1(0.5) | 1(1) | 2(0.6) | |
| **Total** | **208 (100)** | **100(100)** | **308(100)** | |
| **Gender** | | | | |
| **Male** | 92(44.2) | 49(49) | 141(45.8) | **0.431** |
| **Female** | 116(55.8) | 51(51) | 167(54.2) | |

**Serological tests by ELISA assay**

**Anti-Human Parvovirus B-19 Antigen IgG antibodies**: The results showed positive sera of 186(89.4%) and 77(77%) in the studied groups and control, respectively (Figure 1). These were distributed as follow: SA [79, 42.5%; 48(25.8%) females and 31(16.7%) males ] , SS [33, 17.8%; 19(10.3%) females and 14(7.5%) males ], ST [27, 14.5%; 13(7%) females and 14(7.5 %) males ], TT[41, 22%; 23(12.4%) females and 18(9.6%) males ],TM [6,3.2%; 1(0.6%) females and 5(2.6%) males].Positive results of control were [77, 77%; 39(39%) females and 38(38%) males].

**Anti-Human Parvovirus B-19 Antigen IgM antibodies:** The results showed positive sera of 20(9.6%) and 8(8%) in the studied groups and control, respectively (Figure 2). These were distributed as follow; SA [8, 40%; 8(40%) females only] , SS [3, 15%; 2(10%) females and 1(5%) males ] , ST [2, 10%; 2(10%) males only], TT[6 , 30%; 4(20%) females and

2(10%) males ]and TM [1, 5%; 1(5%) males only]. Positive results of control were (8, 8%; 4(4%) for females and males.

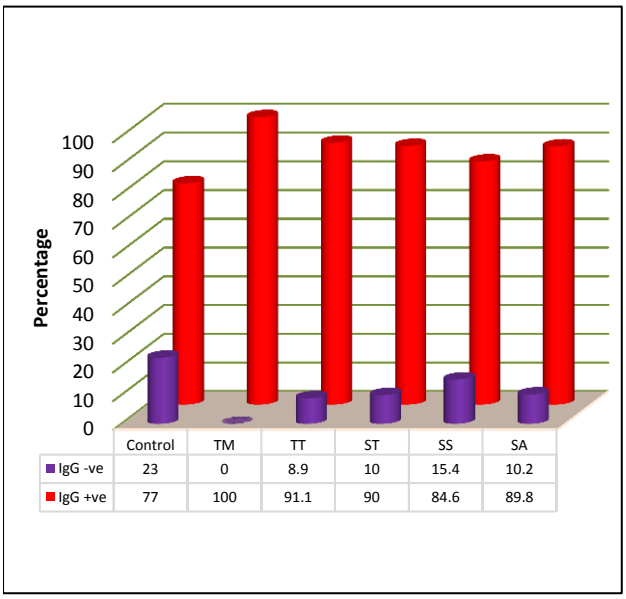


Figure 1. **Seroprevalence of B19V among the study groups and control group, (red: subjects with positive IgG antibody: blue: subjects with negative IgG antibody).**

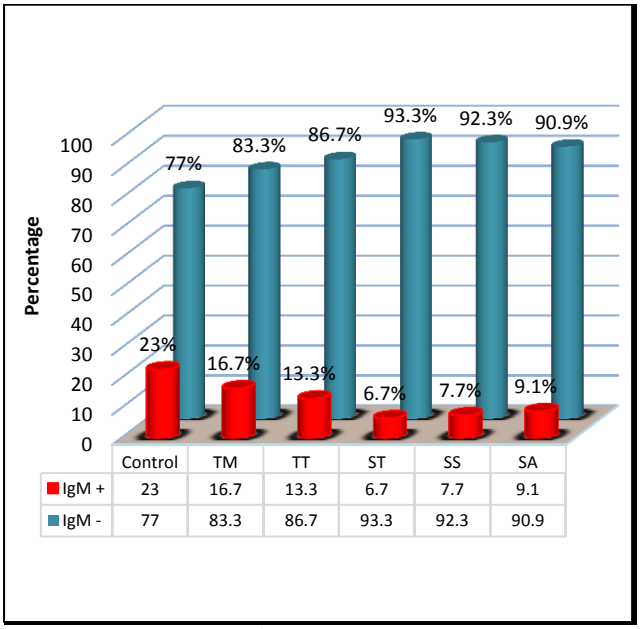


Figure 2. **Seroprevalence of B19V among the study groups and control groups, ( red: subjects with positive IgM antibody: blue: subjects with negative IgM antibody)**.

## DISCUSSION

Human Parvovirus B19V is a pathogenic virus that is occasionally considered as life-threatening specifically for those individuals who have sickle cell and Thalassemia due to which a risk of transient aplastic crisis increases [13].

Detection of B19V IgG and IgM antibodies in a serum sample is generally sufficient in order to understand the course of parvoviral diseases. A positive IgM result in the presence or absence of IgG antibodies reflects an acute infection, and a positive IgG result in the absence of IgM antibodies is indicative of past B19V infection [14]. In the current study, Human Parvovirus B19V infection was classified as recent infection in patients with IgM positivity and/or in those positive for B19 DNA by PCR, prior B19V infection in patients with only IgG positivity and no infection by the absence of any of the B19V markers.

Detection of specific IgM and IgG antibodies can help determine if the infection was recent; however, these antibodies can persist for months or even years after acute infection. This fact has limited the usefulness of this method because it is not possible to determine if the patient has an acute infection (which can put patients with hematological disorders at risk), or if the infection had occurred months prior. Therefore, as previous studies have demonstrated, seroprevalence is usually significantly higher than B19V DNA prevalence.

The present study was used ELISA test according to two types of antibodies. The prevalence of parvovirus B19V infection was 186/208(89.4%) and 20/208(9.6%) of BI9V IgG and BI9V IgM, respectively, in patients with thalassemia and sickle cell disease, also 77/100(77%) and 8/100(8%) of BI9V IgG and BI9V IgM, respectively in control group.

Statistically not significant difference between the prevalence of parvovirus B19 infection and the sex of the patients in both groups (thalassemia and sickle cell disease) (P=0.431).

The study population is divided into 10 age groups, Table 2. More than 60% patients age 1-15 years and only (2.6%) are above 40 years, no statistical significant difference (P<0.979).

In this study there was statistically significant difference in the prevalence of B19V IgG, among studied group compared to control group which was (89.4%) vs (77%) respectively. These results are considered relatively high; this is because all of the patients involved in this study were in a high-risk population (thalassemia and sickle cell disease). B19V virus is highly contagious, common and produces mild disease or could be asymptomatic.

The prevalence of B19V IgG antibody obtained in this study was 89.4% for patient group and 77% of control group which suggests that B19V infection is endemic in Basrah Provence. Furthermore, that the present study showed that thalassemia patients was 92.2% and sickle cell disease patients 88.5%. This result is almost similar to the prevalence of 85.4% reported in Zaria [15] but higher than the prevalence of 39.5% reported in Jos (16) and 39.9% in India [16]. Prevalence ranges of 60-70% have been reported from developed countries such as England [17] and lower prevalence of 16.2% has been reported in Singapore [18]. These discrepancies could be due to differences in the specificity and sensitivity of the assays used. Human parvovirus B19 infection has been reported in many countries around the world and the seropositive rate varies by location [19].

Likewise, in association with diseases of the blood and blood-forming organs, and in disorders involving the immune mechanism, a study conducted in Tunisia by Regaya *et al.*, [20] showed that B19V IgG antibody positivity was 56.5% in patients with sickle cell anemia and 39.1% in patients with beta thalassemia. In Nigeria, IgG and IgM antibody positivity was 61.6% and 17.8%, respectively, in sickle cell anemia. Iwalokun *et al.* [21] detected B19V IgM and IgG antibodies in 17.8% and 61.6%, respectively, of sickle cell anemia patients. B19V IgG and IgM antibody positivity in Kenyan children with severe anemia was found by Wildig et al. [22] to be 14.8% and 3.7%, respectively.

This study however did not demonstrate any association between gender and seropositivity as the prevalence rates were not significantly different between male and female patients. However, a higher seropositivity was observed in female patients than in male patients. This is in agreement with the findings previously reported in Malaysia [23], Iran [19] and Nigeria [16]. The reason for this finding could be because women are always in contact with children.

## CONCLUSIONS

The seroprevalence of human parvovirus antibodies showed that B19V IgG and B19 IgM were (89.4%) and (9.6%), respectively. There was an association between B19V infection and age, as infection increases in patients with hemoglobinopathy between 6 and 10 years of age.

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