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# Infection Rate of Human Parvovirus B19 among Hem dialysis Patients in Bequeath City

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***Abstract:Background:*** *Dialyzed patients have an increasing risk of exposure to viral infection such as Human Parvovirus B19, It is a DNA virus that is responsible for causing several diseases in humans.*
***Objectives:*** *To determine the infection rate of human parvovirus B19 among dialyzed patients in Baqubah City.*
***Patients and methods:*** *Cross-sectional research study which includes 51 dialyzed patients who have been selected randomly from Ibn-Sina Hemodialysis Center in Baqubah Teaching Hospital during the period from September 2016 till February 2017. Full information had been taken directly from the patients and the information had been arranged in an informative formula sheet which includes: age, gender, residence, marital status, education levels, occupation, history of blood transfusion, kidney transplant and associated with other disease. All study subjects were screened for anti-human parvovirus B19 IgM and IgG antibodies using enzyme-linked immunosorbent assay.*
***Result:*** *Anti-human parvovirus B19 IgM antibody was found in 4(7.84%) dialyzed patients and anti-human parvovirus B19 IgG antibody was detected in 46 (90.19%) ones. There was significant difference between both of them. Multivariate analysis of demographic and risk factors showed that male gender, age, marital status, occupation, length of time on hemodialysis and family history were associated with IgM positivity while other showed non-significant differences.*
***Conclusion:*** *The seroprevalence of human parvovirus B19 was relatively high in dialyzed patients in Baqubah-Iraq, and should be investigated after exclusion of other common causes.*
***Key words:*** *Hemodialysis, human parvovirus B19, enzyme-linked immunosorbent assay, kidney disease.*

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## I. Introduction

Chronic kidney disease (CKD), also known as chronic renal disease, is progressive loss in kidney function over a period of months or years [1]. The most common recognized cause of CKD is diabetes mellitus. High blood pressure is also a very common cause of chronic kidney disease. Other causes of CKD include idiopathic (i.e. unknown cause, often associated with small kidneys on renal ultrasound) and glomerulonephritis [2]. Together, these cause about 75% of all adult cases. Historically, kidney disease has been classified according to the part of the kidney anatomy involved[3].

Hemodialysis (HD) is a process of purifying the blood of a person whose kidneys are not working normally. This type of dialysis achieves the extracorporeal removal of waste products such as creatinine and urea and free water from the blood when the kidneys are in a state of kidney failure. Hemodialysis is one of three renal replacement therapies (the other two being kidney transplant and peritoneal dialysis) [4].

Hemodialysis patients are particularly predisposed to infections. It seems that the HD procedure per se as well as disturbances in both innate and adaptive immunity significantly contribute to this susceptibility. Infections are the major cause of morbidity and the second cause of death following cardiovascular events in HD patients. Episodes of bacteremia and pneumonia account for the majority of severe infections in this population as well as blood transmitted viral infections [5].

Human parvovirus B19 has been linked to renal disease in three settings: As a cause of acute glomerulopathy and as a cause of anemia in ESRD and kidney transplantation [6]. Human parvovirus B19 is a non-enveloped icosahedral a single-stranded DNA virus that is a member of the parvoviridae family [7]. Immunosuppressed patients can fail to mount an effective immune response to B19, resulting in prolonged or persistent viremia [8]. The mode of transmission for human parvovirus B19 in normal hosts is through the respiratory tract. Other possible routes of transmission suggested include donor graft [9]. The transmission rate is about 50 percent for those living with infected persons [10]

Most persons with human parvovirus B19 infection are asymptomatic or exhibit mild, non-specific, cold-like symptoms that are never linked to the virus[11]. There are two types of diagnostic tests to confirm parvovirus B19 infection: B19-specific antibody testing and viral DNA testing. Giant pronormoblasts on a peripheral blood smear or in a bone marrow aspirate are suggestive of parvovirus B19 infection but are not diagnostic [12].

The present study is designed to determine the infection rate of human parvovirus B19 among dialyzed patients and to investigate any related aspects with different parameters such as age, gender, residence, marital status, occupation, duration of diyalsis, family history, history of blood transfusion and having knowledge about the disease and others.

**Patients and methods**

Cross-sectional research study includes 51 patients with hemodiyalasis, who have been selected randomly from Ibn-Sina hemodialysis center in Baqubah Teaching Hospital during the period from September 2016 till February 2017.

Full information had been taken directly from the patients and the information has been arranged in an informative formula sheet which includes: age, gender, residence, marital status, education levels, occupation, history of blood transfusion and having knowledge about the disease and others.

Two milliliters of blood samples were collected via vein puncture and used to evaluate anti-human parvovirus B19 IgM (Ridascreen-K6031-Germany) and anti-human parvovirus B19 IgG (Ridascreen -K6021- Germany) using enzyme-linked immunosorbent assay**.**

**Statistical analysis**

All date were analyzed with the statistical package for the social sciences (SPSS), version 13, the researchers performed the Chi-square analysis and p-value  0.05 and it was considered statistically significant.

## II. Results

Table (1) summarizes the demographic characteristic of 51 hemodiyalasis patients. There was a higher proportion of males 32 (62.74%) than females 19(37.25%) but statistically not significant. The age range was 15 to 70 years with mean age 48.5 years. Most of the patients were in age group 19 (73.25%); 22(43.13%) were living in urban area and 29(56.56%) were living in rural area. Forty-nine patients (96.07%) were married while only 2(3.92%) patients were single. Regarding educational background, 10 patients (19.60%) were illiterate, 15 patients (29.41%) had primary school, 19 patients (37.25%) had secondary school and 7 patients (13.72%) had an academic degree. Significant differences were noticed with age, marital status, occupation and duration of diyalsis though there were no -significant difference with other factors.

**Table (1):** Socio-demographic characteristics among studied group.

| **Parameters** | **No. (%)** | **P value** |
|---|---|---|
| **Gender type** | | 0.069 |
| Male | 32 (62.74%) | |
| Female | 19(37.25%) | |
| **Age groups** | | 0.000* |
| 5-20 years | 1(1.96%) | |
| 21-36 years | 10(19.60%) | |
| 37-52 years | 19(73.25%) | |
| 53-70 years | 21(41.10%) | |
| **Residence** | | 0.372 |
| Urban | 22(43.13%) | |
| Rural | 29(56.56%) | |
| **Marital status** | | 0.000* |
| Single | 2(3.92%) | |
| Married | 49(96.07%) | |
| **Education** | | 0.084 |
| Illiterate | 10(19.60%) | |
| primary school | 15(29.41%) | |
| Secondary school | 19(37.25%) | |
| High education | 7(13.72%) | |
| **Duration of diyalsis** | | 0.036* |
| Less than 1 year | 33(64.70%) | |
| More than 1 year | 18(35.29%) | |

*Significant at $p < 0.05$

The risk factor amongst the studied patients, 44 cases (86.27%) presented a family history, while 15/51(29.41%) gave a blood transfusion, only 3 cases (5.88%) had a kidney transplant, related with other disease were 15(29.41%) and 12 cases (88.23%) gave a smoking habit as shown in table 2.

Table (2): Distribution of haemodialysis patients according to risk factor.

| **Risk Factor** | **Yes No. (%)** | **No No. (%)** | **P value** |
|---|---|---|---|
| Family History | 44(86.27%) | 7(13.72%) | 0.000* |
| Blood transfusion | 15(29.41%) | 36(70.58%) | 0.003* |
| Kidney transplant | 3(5.88%) | 48(94.11%) | 0.000* |
| Associated with other disease | 15(29.41%) | 36(70.58%) | 0.003* |
| Smoking habit | 45(88.23%) | 6(11.76%) | 0.000* |

*** Significant at p < 0.05**

The results of enzyme linked immunosorbent assay revealed that 4 serum patients (7.84%) were positive to anti-human parvovirus B19 IgM and 47 serum patients (92.15%) were positive to anti-human parvovirus B19 IgG. Statistical analysis shows significant difference as shown in table 3.

**Table (3):** Comparison between human parvovirus B19 IgM and IgG in studied group.

| Parameters | **ELISA result No. (%)** | **No No. (%)** | **p-value** |
|---|---|---|---|
| IgM | Positive% | 4(7.84%) | Chi-square- 69.2031<br>Significant at p < 0.05 |
| | Negative% | 47(92.15 %) | |
| | Total | 51(99.99%) | |
| IgG | Positive% | 46 (90.19%) | |
| | Negative% | 5(9.80%) | |
| | Total | 51(99.99%) | |

The positive anti-parvovirus B19 IgM among the studied patients was 4 cases**.** The relation between positive anti-parvovirus B19 IgM and different socidemographic characters which demonstrated significant differences with marital status, occupation and duration of diyalsis while non significant occur with others as shown in table 4.

**Table (4):** Comparison between human parvovirus B19 IgM positive and negative result in studied group.

| **Parameters** | **Positive No. (%)** | **Negative No. (%)** | **p-value** |
|---|---|---|---|
| **Gender type** | | | 0.582<br>Non-significant- p < .05 |
| Male | 2(6.25%) | 30(93.75%) | |
| Female | 2(10.52%) | 17(89.74%) | |
| **Age groups** | | | 0.281<br>Non-significant - p < .05 |
| 5-20 years | 0 | 1(100%) | |
| 21-36 years | 2(20%) | 8(80%) | |
| 37-52 years | 0 | 19(100%) | |
| 53-70 years | 2(9.52%) | 19(90.47% | |
| **Residence** | | | P-0.445<br>Non-significant - p < .05 |
| Urban | 1(4.45%) | 21(95.45%) | |
| Rural | 3(10.34%) | 26(89.65%) | |
| **Marital status** | | | 0.582<br>Significant at p < 0.05 |
| Single | 1(50%) | 1(50%) | |
| Married | 3(6.12%) | 46(93.87%) | |
| **Education** | | | 0.416<br>Non-significant - p < .05 |
| Illiterate | 2(20%) | 8(80%) | |
| primary school | 1(6.66%) | 14(93.33%) | |
| Secondary school | 1(5.26%) | 18(94.37%) | |
| High education | 0 | 7(13.72%) | |
| **Duration of diyalsis** | | | 0.653<br>Significant at p < 0.05 |
| Less than 1 year | 3(9.09%) | 30(90.90%) | |
| More than 1 year | 1(5.55%) | 17(94.44%) | |

Regarding risk factor of all human parvovirus B19 IgM positive and negative results were distributed in table (5). Two (28.57%) participants were positive and had family history whereas all positive cases had not a history of blood transfusion and kidney transplant, 1(6.66%) was tested with other disease while smoking habit occurring in all positive cases.

**Table (5): Distribution of patients with anti-human parvovirus B19 infection according to result of IgM.**

| Risk Factor | Yes Number(%) | No Number(%) | p-value |
|---|---|---|---|
| **Family History** | | | |
| Positive | 2(4.54%) | 2(28.57%) | 0.028 |
| Negative | 42(95.45%) | 5(71.42%) | |
| Total | 44(86.27%) | 7(13.72%) | |
| **Blood transfusion** | | | |
| Positive | 0 | 4(100%) | |
| Negative | 15 | 32 | 0.179 |
| Total | 15(29.41%) | 36(70.58%) | |
| **Kidney transplant** | | | |
| Positive | 0 | 4(8.33%) | 0.602 |
| Negative | 3(5.88%) | 44(91.66%) | |
| Total | 3(5.88%) | 48(94.11% | |
| **Associated with other disease** | | | |
| Positive | 1(6.66%) | 3(8.33%) | 0.840 |
| Negative | 14(93.33%) | 33(91.66%) | |
| Total | 15(29.41%) | 36(70.58%) | |
| **Smoking habit** | | | |
| Positive | 4(8.88%) | 0 | 0.447 |
| Negative | 41(91.11%) | 6 | |
| Total | 45(88.23%) | 6(11.76%) | |

Some important patient characteristics such as age, gender, residence, marital status, educational level, occupation and duration of diyalsis were compared among the seropositive groups. As demonstrated in the table 6, there was no significant difference with all parameters.

**Table (6):** Comparison between anti-human parvovirus B19 IgG positive and negative result in studied group.

| Parameters | Positive No. (%) | Negative No. (%) | p-value |
|---|---|---|---|
| **Gender type** | | | 0.89 Non-significant - p < .05 |
| Male | 29(90.62%) | 3(9.37%) | |
| Female | 17(89.47%) | 2(10.52%) | |
| **Age groups** | | | 0.794 Non-significant - p < .05 |
| 5-20 years | 1(100%) | 0 | |
| 21-36 years | 9(90%) | 1(10%) | |
| 37-52 years | 18(94.73%) | 1(5.26%) | |
| 53-70 years | 18(85.71%) | 3(23.80%) | |
| **Residence** | | | 0.42 Non-significant - p < .05 |
| Urban | 19(86.36%) | 3(13.63%) | |
| Rural | 27(93.10%) | 2(6.89%) | |
| **Marital status** | | | 0.634 Non-significant - p < .05 |
| Single | 2(100%) | 0 | |
| Married | 44(89.79%) | 5(10.20%) | |
| **Education** | | | 0.011 Non-significant - p < .05 |
| Illiterate | 7(70%) | 3(30%) | |
| primary school | 15(100%) | 0 | |
| Secondary school | 19(100%) | 0 | |
| High education | 5(71.42%) | 2(28.57%) | |
| **Duration of diyalsis** | | | 0.45 Non-significant - p < .05 |
| Less than 1 year | 29(78.78%) | 4(12.12%) | |
| More than 1 **year** | 17(94.44%) | 1(5.55%) | |

According to distribution of anti-human parvovirus B19 IgG, positive results were with risk factor. Majority of the participants, 43(97.72%) had family history and 44(97.77%) smoking habit. Only 10(66.66%) with blood transfusion and associated with other disease while low frequency of positive cases were registered among patients with kidney transplant. Statistical analysis showed significant differences as summarized in table (7).

**Table (7)**: Distribution of patients with human parvovirus B19 infection according to result of IgG.

| **Risk Factor** | **Yes Number(%)** | **No Number(%)** | **p-value** |
|---|---|---|---|
| **Family History** | | | |
| Positive | 43(97.72%) | 3(42.85%) | 0.000 |
| Negative | 1(2.27%) | 4(57.14%) | |
| Total | 44 | 7 | |
| **Blood transfusion** | | | |
| Positive | 10(66.66%) | 36(100%) | 0.000 |
| Negative | 5(33.33%) | 0 | |
| Total | 15 | 36 | |
| **Kidney transplant** | | | |
| Positive | 2(66.66%) | 44(91.66%) | 0.158 |
| Negative | 1(33.33%) | 4(8.33%) | |
| Total | 3 | 48 | |
| **Associated with other disease** | 10(66.66%) | 36(100%) | 0.000 |
| Positive | 5(33.33%) | 0 | |
| Negative | 15 | 36 | |
| Total | | | |
| **Smoking habit** | | | |
| Positive | 44(97.77%) | 2(33.33%) | 0.000 |
| Negative | 1(2.22%) | 4(66.33%) | |
| Total | 45 | 6 | |

## III. Discussion

The current study is done due to few studies which had already been carried out on the B19 frequency in dialysis patients. So the result of this study showed that infection rates of human parvovirus B19 in Baqubah city of Iraq, 4(7.84%) were positive to human parvovirus B19 IgM and 46 (90.19%) were positive to human parvovirus B19 IgG. This result conforms with study carried out by Sharif *et al*.(2016) who found the same result among Iranian hemodiaylasis and peritoneal dialysis patients [13].

The prevalence of immunoglobulin G (IgG) antibodies directed against human parvovirus B19 ranges from 15 to 60% in children 6 to 19 years old: and from 30 to 60% in adults and is more than 85% in the geriatric population [14][15][16]. Furthermore, the result of present study conforms with many investigations which have been carried out in different parts of the world [17][18][19].

However, patients with renal failure on dialysis have disruptions in their immune system due to the immunosuppressive effects of uremia, deficient erythropoietin production, and significantly decreased erythrocyte survival [9][10]. Therefore, dialysis patients reveal an increasing susceptibility to human parvovirus B19 infection.

Human parvovirus B19 infection was higher in age group of 53-70 years than others age groups as registered, this result is relatively comparable with that reported by other studies [20][21]. This may be relevant to the rising incidence with age and may be explained by the thymus function which is known to decline with age. The thymus reaches its maximal size at puberty and then atrophies, with a significant decrease in both cortical and medullary cells and an increase in the total fat content of the organ. Whereas the average weight of the thymus is 30 grams in human infants, its age-dependent involution leaves an organ with an average weight of only 3 grams in the elderly [22]. Moreover, it may be related with decline in the number of NK, which plays an important role in early natural surveillance against cancer and infectious disease, a progressive age-related shift in the circulating lymphocyte population from conventional T cells to NK cells [23].

Approximately half of the adult population has been exposed to this agent and acquired immunity between the ages of five and 19 years, with seroprevalence increasing with age [24][25].

Chronic kidney disease infection occurred in all age groups and genders with no significant difference among these groups. This indicates that final stage of renal failure affects the economically productive age group which is unlike the situation in many developed countries in which the mean age of ESRF patients is generally over 60 years. This result is in agreement with Amin *et al* (2015).Who showed that the mean age of ESRF patients is 49 ± 15.8 years and 47.9 % of ESRF patients [26].

The result of current study revealed that most infection is nearly three times more common in males than in females but without significant difference.

The result of current study demonstrated that no significant difference in gender, educational level, history of HD, this disagrees with result of study done by Khameneh *et al*. (2014) who found that there was no significant difference in age, sex, educational status, history of blood transfusion, history of HD and immunosuppressive therapy among kidney transplant recipients with positive human parvovirus B19 [27].

In conclusion, the seroprevalence of human parvovirus B19 was relatively high in dialyzed patients in Bagubah- Iraq, and should be investigated after exclusion of other common causes. Further studies are needed to assess the role of other viruses in heamodiyalasis patients.

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**Conflict of Interest**: None to declare.

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