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INVESTIGATION OF BK VIRUS INFECTION CHARACTERISTICS IN PATIENTS WITH END-STAGE CHRONIC KIDNEY DISEASE BEFORE KIDNEY TRANSPLANTATION AT MILITARY HOSPITAL 103

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ABSTRACT

Objectives: Investigate BK (Human polyomavirus) virus infection characteristics and their association with selected clinical and subclinical features in end-stage renal disease patients before kidney transplantation.

Patients and methods: A cross-sectional study, including 80 kidney transplant patients and 80 healthy kidney donors at Military Hospital 103. Venous blood samples were collected and anticoagulated with ethylenediaminetetraacetic acid (EDTA). BK-IgG antibodies were detected using the ELISA kit.

Results and discussions: In a cohort of 80 patients with end-stage chronic kidney disease, 21.3% (17/80) tested seropositive for BK-IgG, while 78.7% (63/80) were seronegative, showing no significant difference compared to the healthy control group. The prevalence of BK virus seropositivity was not significantly associated with age, gender, body mass index (BMI), etiology of renal failure, duration of dialysis, pre-transplant dialysis modality, or anemia status.

Conclusion: Latent BK virus infection was detected at a significant prevalence using serological methods in end-stage chronic kidney disease patients before kidney transplantation.

Keywords: Kidney transplantation; BK virus; BK-IgG; clinical, paraclinical.

1. INTRODUCTION

BK virus (Human polyomavirus or BKV) infection is a common opportunistic infection in kidney transplant recipients. BKV reactivation can cause irreversible damage to the renal parenchyma, ultimately leading to graft dysfunction and loss of allograft function [1]. BK virus, a member of the Polyomaviridae family, typically remains latent in immunocompetent individuals, with seroprevalence rates varying significantly across different regions of the world [2]. Under normal immune conditions, BKV remains inactive and is only detectable through the presence of anti-BKV IgG antibodies. Following kidney transplantation, immunosuppression due to anti-rejection therapy facilitates either reactivation of latent BKV or new infection, resulting in allograft injury and, over time, decreased or lost graft function [3]. Preliminary studies suggest that pre-transplant BKV infection may serve as a predictive factor for post-transplant reactivation, contributing to an increased risk of graft dysfunction [4]. However, the presence of BKV and its association with clinical and paraclinical manifestations remain insufficiently studied [5]. Therefore, this study was conducted to investigate the characteristics of pre-transplant BKV infection by detecting BKV-IgG antibodies in plasma and analyzing their correlation with selected clinical and paraclinical parameters in patients with end-stage renal disease (ESRD) at Military Hospital 103.

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2. SUBJECT AND METHOD

2.1. Subject

The study included 80 patients with end-stage chronic kidney disease (ESKD) and 80 healthy kidney donors treated at the Military Hospital 103 from March 2024 to April 2025. All participants had complete medical records and provided voluntary consent to participate in the study.

- Inclusion criteria for patients:

+ Diagnosed with end-stage chronic kidney disease

+ Aged 18 years or older

+ Provided informed consent to participate in the study.

- Exclusion criteria for patients:

Refused to participate in the study.

- Inclusion criteria for healthy individuals:

+ Individuals aged over 18 years.

+ Evaluated and confirmed to be healthy at Military Hospital 103.

- Exclusion criteria for healthy individuals:

Individuals who did not agree to participate in the study.

2.2. Methods

Study design:

This was a cross-sectional study.

Study procedures:

Patients who met the inclusion criteria and provided informed consent were enrolled in the study. Clinical and paraclinical data were collected using a pre-designed research case report form, which included demographic and administrative information, medical history, etiology of chronic kidney disease, pre-transplant treatment methods, HLA typing results, and hematological and biochemical indices at the time of transplantation.

Venous blood samples (3 mL) were collected in EDTA-anticoagulated tubes and centrifuged at 2000 rpm for 5 minutes. Plasma and blood cells were separated and stored at –80°C until analysis. All blood samples were collected at the time of admission to the hospital.

Detection of anti-BK virus antibodies:

Serum anti-BK IgG antibodies were detected using the Qualitative Human BK Virus IgG (BK-IgG) ELISA Kit (MyBioSource), following the manufacturer's instructions.

Data analysis:

Data were recorded using Microsoft Office Excel 2016 and analyzed using SPSS version 25. A significance level of $p < 0.05$ was considered statistically significant. The Mann–Whitney U test was used to compare non-normally distributed quantitative variables, and the Chi-square test was used to compare categorical variables.

2.3. Research Ethics

The study was approved by the Institutional Review Board of the Military Hospital 103 for Biomedical Research Ethics (Approval No. 09/CNChT-HDDD, dated August 27, 2021).

3. RESULTS

Table 1. Baseline characteristics of the study participants

Characteristics		Recipient	Donor	p-value
		n (%) Mean ± SD (min - max)	n (%) Mean ± SD (min - max)	
Age		43.86±12.22	36.63 ± 6.60	< 0.05
		(20 - 71)	(25 - 57)	
Sex	Male	51 (63.7)	43 (53.7)	> 0.05
	Female	29 (12.1)	38 (46.3)	
BMI (kg/m^2)		20.99 ± 2.64	20.81 ± 2.86	> 0.05
Duration of dialysis (months)		18.35±34.16 (0 – 216)		

The mean age of kidney transplant recipients was 43.86 ± 12.22 years (range: 20–71 years), while the mean age of healthy kidney donors was 36.63 ± 6.60 years (range: 25–57 years). The recipients were significantly older than the donors, with a p-value < 0.05

Table 2. Characteristics of anti-BK virus antibodies

Characteristics		Recipient n (%)	Donor n (%)	p-value
BK IgG	Negative	63 (78.8)	56 (75.0)	> 0.05
	Positive	17 (21.3)	24 (25.0)	

The seropositivity rate of BK IgG in patients with end-stage chronic kidney disease before kidney transplantation was 21.3%, while 78.8% were seronegative. Among healthy kidney donors, 25.0%

were positive for BK IgG, and 75.0% were negative. There was no significant difference in BK IgG seropositivity between patients with chronic kidney disease and healthy donors.

Table 3. Association between BK IgG status and age groups of recipients

Age Group (years)	BK IgG	
	Negative (n)	Positive (n)
<30	8	2
30-40	16	6
40-50	15	6
50-60	17	3
≥60	7	0
p-value	> 0.05	

There was no significant difference in the rate of BK IgG positivity among the recipient age groups (p > 0.05).

Table 4. Association between BK IgG status and sex

Parameters		BK IgG	
		Negative (n)	Positive (n)
Patient sex	Male	42	9
	Female	21	8
	p-value	> 0.05	

The difference in BK IgG positivity between male and female patients was not statistically significant (p > 0.05), indicating that sex does not appear to influence the status of BK virus infection.

Table 5. Association between BK IgG and pre-transplant BMI

BMI Category	BK IgG	
	Negative (n)	Positive (n)
Underweight (≤18.5)	12	2
Normal (18.5–23)	35	11
Overweight (23–25)	12	2
Obese (≥25)	4	2
p-value	> 0.05	

There was no significant association between BK IgG status and BMI (p > 0.05), suggesting that BMI does not affect pre-transplant BK virus antibody status.

Table 5. Association between BK IgG and etiology of end-stage renal disease

Etiology of ESRD	BK IgG	
	Negative (n)	Positive (n)
Chronic glomerulonephritis	53	15
Polycystic kidney disease	1	0
Systemic lupus erythematosus	2	0
Chronic pyelonephritis	2	0
Primary hypertension	1	1
Diabetes mellitus	1	1
Chronic gout	2	0
IgA nephropathy	1	0
p-value	> 0.05	

There was no significant association between BK IgG status and the underlying cause of ESRD (p > 0.05), indicating that the etiology of renal failure is not related to BK virus infection.

Table 6. Association between BK IgG and duration of dialysis before transplant

Duration of Dialysis (months)	BK IgG	
	Negative (n)	Positive (n)
< 12 months	41	8
12–24 months	10	6
24–36 months	5	1
> 36 months	7	2
p-value	> 0.05	

No significant association was found between dialysis duration before transplantation and BK IgG status (p > 0.05), suggesting that the length of dialysis does not influence BK antibody levels.

Table 7. Association between BK IgG and dialysis modality before transplant

Dialysis Modality	BK IgG	
	Negative (n)	Positive (n, %)
No dialysis	8	2 (20.0%)
Hemodialysis	53	14 (20.8%)
Peritoneal dialysis	2	1 (33.3%)
p-value	> 0,05	

The type of dialysis (none, hemodialysis, or peritoneal dialysis) did not significantly affect the BK IgG positivity rate ($p > 0.05$), indicating no association between dialysis modality and BK virus antibody status.

Table 8. Association between BK IgG and pre-transplant anemia status

Anemia Status	BK IgG		p-value
	Negative (n)	Positive (n)	
No anemia	10	3	>0.05
Mild anemia	25	8	
Moderate anemia	23	5	
Severe anemia	5	1	
Mean Hemoglobin (SD) (g/L)	102,86 (5,77)	105,88 (18,84)	

There were no significant differences in anemia status or mean hemoglobin levels between BK IgG-negative and positive groups ($p > 0.05$), suggesting that anemia is not associated with BK virus infection.

4. DISCUSSION

This study was conducted to evaluate the association between BK virus (BKV) infection and clinical as well as paraclinical characteristics in pre-transplant kidney recipients, based on the hypothesis that BKV infection might influence the pre-transplant condition. The results showed that the prevalence of BK IgG seropositivity was 21.3%, which is consistent with the latent infection rate reported in the adult population [2]. However, there was no significant association between BK IgG positivity and factors such as age, sex, body mass index (BMI), etiology of end-stage renal disease, duration or modality of dialysis, anemia status, or renal function indices ($p > 0.05$). These findings suggest that pre-transplant BKV infection does not significantly affect the clinical or paraclinical characteristics in this cohort.

Our findings align with those of previous studies, such as Hirsch et al. (2002) [4], which demonstrated that latent BKV infection is common but not necessarily associated with overt clinical manifestations before transplantation. However, Ramos et al. (2009) reported that the presence of BKV before transplantation may serve as a predictor of post-transplant reactivation, which was not assessed in the current study due to limitations in follow-up duration [5]. This discrepancy may be attributed to the cross-sectional design of our research, while other investigations have primarily focused on the post-transplant period.

BKV typically persists in a latent state within the host and tends to reactivate under conditions of immunosuppression, such as in transplant candidates. Nonetheless, the absence of association with clinical and paraclinical features in our study might reflect an insufficient degree of immunosuppression during the pre-transplant stage to trigger viral reactivation. Additionally, BK IgG antibodies merely indicate prior exposure and do not reflect current viral activity [3], which may explain the lack of significant differences among groups.

Our findings suggest that screening for BK IgG alone in the pre-transplant setting may be inadequate for predicting BKV-related complications during this phase. However, these data provide a basis for assessing latent infection risk and underscore the importance of post-transplant BKV surveillance, when the risk of viral reactivation is considerably higher [1].

5. CONCLUSION

This study indicates that latent BKV infection is prevalent, but it is not significantly associated with clinical and paraclinical characteristics in pre-renal transplant patients. Further research is needed to evaluate the features of BK virus infection before kidney transplantation and to conduct long-term follow-up to assess the impact of BKV post-transplantation.

REFERENCES

[1] Schwarz, A., et al., Viral origin, clinical course, and renal outcomes in patients with BK virus infection after living-donor renal transplantation. Transplantation, 2016. 100(4): p. 844-853.

[2] Hirsch, H.H. and J. Steiger, Polyomavirus Bk. The Lancet Infectious Diseases, 2003. 3(10): p. 611-623.

[3] Nickeleit, V., et al., BK-virus nephropathy in renal transplants—tubular necrosis, MHC-class II expression and rejection in a puzzling game. Nephrology Dialysis Transplantation, 2000. 15(3): p. 324-332.

[4] Hirsch, H.H., et al., Prospective study of polyomavirus type BK replication and nephropathy in renal-transplant recipients. New England Journal of Medicine, 2002. 347(7): p. 488-496.

[5] Ramos, E., et al., The decade of polyomavirus BK-associated nephropathy: state of affairs. Transplantation, 2009. 87(5): p. 621-630.