Brazilian Journal of TRANSPLANTATION

https://doi.org/10.53855/bjt.v27i1.562_ENG

ORIGINAL PAPER

Prevalence of Urinary Symptoms and Predictive Factors in Kidney Transplant Patients in a Brazilian Center

Diego Henrique Gomes Sobrinho[1,*], Kézia Jahel Santos Tomaz[1], Guilherme Rodrigues Schwamback[1], Renata Gonçalves Santos Rodrigues[1], Alessandro Corrêa Prudente dos Santos[1]

1. Universidade Federal de Rondônia – Porto Velho (RO) – Brazil.

*Corresponding author: diegohenriquegs1@gmail.com

Section editor: Ilka de Fátima Santana F. Boin

Received: Jan. 28, 2024 | Accepted: Feb. 29, 2024

ABSTRACT

Objectives: Identify relationships between voiding symptom scores and variables related to transplantation. **Methods:** Observational, cross-sectional, and analytical study, in which all patients undergoing kidney transplantation in the state of Rondônia, Brazil, were evaluated through interviews and analysis of records, regarding their clinical-demographic profile and signs and symptoms of voiding dysfunction. Chi-square, analysis of variance (ANOVA), and multivariate linear regression were used to establish possible correlations. **Results:** Eight-one point eighty-seven percent of patients were approached (n = 122). The most common symptoms were increased frequency (68.2%) and nocturia (97.6%). ANOVA demonstrated a relationship between age and International Consultation on Incontinence Questionnaire (ICIQ) (p = 0.014), alcoholism and Overactive Bladder Questionnaire (OAB) (p = 0.001), immunosuppressive regimen and ICIQ (p = 0.04), thymoglobulin and OAB (p = 0.009), use of double J and ICIQ (p = 0.014), citomegalovirus infection and OAB (p = 0.031), and International Prostate Symptom Score (IPSS) (p = 0.008). Of the comorbidities, it was observed heart failure related to OAB (p = 0.009) and ICIQ (p = 0.003) scores. Chi-square showed an association between alcohol use and group 1 of the OAB (p = 0.005). The Pearson test positively correlated graft ischemia time with ICIQ (p = 0.04). **Conclusion:** The prevalence of lower urinary tract symptoms is higher in kidney transplant recipients than in the general population, and it was possible to determine predictive factors for their occurrence.

Keywords: Organ Transplantation; Kidney Transplantation; Miction; Urinary Bladder Overactive; Urinary Incontinence.

Prevalência de Sintomas Miccionais e Fatores Preditivos em Transplantados Renais em um Centro Transplantador Brasileiro

RESUMO

Objetivos: Identificar relações entre escores de sintomas miccionais e variáveis relacionadas ao transplante. **Métodos:** Estudo observacional, transversal e analítico no qual o conjunto dos pacientes submetidos a transplante renal no estado de Rondônia, Brasil, foi avaliado por meio de entrevistas e análise de registros quanto a seu perfil clínico-demográfico e aos sinais e sintomas de disfunção miccional. Qui-quadrado, *analysis of variance* (ANOVA) e regressão linear multivariada foram utilizados para estabelecer possíveis correlações. **Resultados:** Abordaram-se 81,87% dos pacientes (n = 122). Os sintomas mais frequentes foram aumento da frequência (68,2%) e noctúria (97,6%). O teste ANOVA demonstrou relação entre a idade e o International Consultation on Incontinence Questionnaire (ICIQ) (Questionário Internacional de Consulta sobre Incontinência) (p = 0,014), etilismo e o Overactive Bladder Questionnaire (OAB-V8) (Questionário de Avaliação da Bexiga Hiperativa) (p = 0,001), esquema imunossupressor e ICIQ (p = 0,04), timoglobulina e OAB (p = 0.009), uso de duplo J e ICIQ (p = 0,014), infecção por citomegalovírus e OAB (p = 0,031) e International Prostate Symptom Score (IPSS) (Escore Internacional de Sintomas Prostáticos) (p = 0,008). Das comorbidades, foi observada insuficiência cardíaca relacionada aos escores OAB (p = 0,009) e ICIQ (p = 0,003). Qui-quadrado apontou associação entre uso de álcool e grupo 1 do OAB (p = 0,005). O teste de Pearson correlacionou positivamente tempo de isquemia do enxerto com ICIQ (p = 0,04). **Conclusão:** A prevalência de sintomas do trato urinário inferior é maior em transplantados renais do que na população geral, e foi possível determinar fatores preditivos para sua ocorrência.

Palavras-chave: Transplante de Órgãos; Transplante de Rim; Micção; Bexiga Urinária Hiperativa; Incontinência Urinária.

INTRODUCTION

Brazil has been a world leader in the performance of organ transplants, despite the drop in numbers observed due to the coronavirus disease 2019 (COVID-19) pandemic[1]. In 2021, it was the nation with the fourth-highest absolute number of kidney transplants performed, second only to the United States, China and India[2]. Given the high number of kidney transplants in the world and their relevance as a treatment for life-threatening clinical conditions, it is essential to study possible complications and dysfunctions after the surgical procedure.

It is not uncommon to observe, after kidney transplant surgeries, patients with disturbances in urinary functions. The prevalence of lower urinary tract symptoms (LUTS) in the group of kidney transplant recipients is high and variable between studies, with rates reaching 80%[3]. Voiding dysfunction can be characterized by symptoms according to their relationship with the bladder storage phase (change in urinary frequency, incontinence, urgency and nocturia), bladder emptying phase (hesitation, straining, weak or intermittent stream and dysuria) or even with other symptoms (containment maneuvers, sensation of incomplete emptying, urinary retention, post-void dripping and urinary stream under pressure)[4].

Patients with long periods of dialysis and anuria before transplantation tend to present, after receiving the graft, a decrease in bladder storage capacity, detrusor hyperactivity and, consequently, voiding dysfunction[5]. In non-neurogenic cases, LUTS adaptation occurs during the 1st semester after transplantation. However, some patients develop LUTS dysfunctions that can affect their quality of life or even the quality of the transplanted graft[6].

In addition to these apparent consequences, voiding dysfunction has the potential to increase susceptibility to urinary tract infection (UTI), which affects kidney graft function and mortality in kidney transplant patients[7]. Furthermore, several risk factors related to infectious complications are present after kidney transplantation, of which the need for permanent use of immunosuppression can be highlighted[8].

After this initial bibliographical review, we realized that there is still little information in the literature on the topic of voiding dysfunctions in transplant patients. Furthermore, the studies have small samples and very heterogeneous designs, and, for the most part, they do not use validated tools that quantify the intensity and importance of these symptoms in this group of patients. Based on this scenario, this work aims to evaluate the prevalence and presence of predictive factors for signs and symptoms of voiding dysfunction in transplant patients followed up in a Brazilian kidney transplant service.

METHODS

Study design

This is a cross-sectional study approved by the ethics committee of the Federal University of Rondônia (opinion no. 2,750,468) and carried out at the Renal Transplant Outpatient Clinic, Porto Velho, state of Rondônia, Brazil. Kidney transplant patients being followed up at this service, aged 18 or over, who understood and agreed to participate in the study by signing the informed consent form were included.

From October 2018 to May 2019, 206 patients underwent follow-up at the state service. Patients were excluded if a) they did not undergo medical consultation with the kidney transplant team during the data collection period, b) they had lost graft function and were on dialysis, and c) they had a confirmed urological diagnosis and were undergoing treatment unrelated to the transplant. Thus, 57 patients met the adopted exclusion criteria, making the target the remaining 149 patients. Of these, 122 (81.9%) were achieved. For statistical purposes, patients were separated into two age groups: the first 18-40 years old and the second over 40 years old. This division was proposed due to the higher prevalence of LUTS in patients over 40 years of age in both sexes, described in international literature.

The information necessary for the study was obtained through the following instruments: a) form for collecting clinical-epidemiological data related to the transplant process (pre-, peri- and post-transplant); b) Overactive Bladder Questionnaire (OAB-V8) (Overactive Bladder Assessment Questionnaire), validated in Portuguese by Pereira et al.; c) International Prostate Symptom Score (IPSS), validated by Berger et al.; and d) International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF), validated by Tamanini et al. For this, conducting interviews using questionnaires and obtaining data through physical and electronic records was necessary.

In addition to the validated questionnaires (OAB-V8, ICIQ-SF and IPSS) and the global standard assessment, severity stratification subgroups found in several articles from renowned journals in the field were used. The subgroups are as follows:

OAB – Group 1 (score < 8) and Group 2 (> 8).

ICIQ – Group 0 (score = 0), Group 1 (1 to 3 points), Group 2 (4 to 6 points), Group 3 (7 to 9 points) and Group 4 (more than 10 points).

IPSS – Group 1 (0 to 7 points), Group 2 (8 to 19 points) and Group 3 (20 to 35 points).

Statistical analysis

After data collection, the IBM SPSS Statistics version 25 software was used to produce the evaluation and descriptive synthesis of the results. The analysis of variance (ANOVA) and chi-square tests were used to verify the association between possible risk factors and the occurrence of voiding disorders. Multivariate linear regression, in turn, was used to evaluate the correlation between possible predictive factors and the occurrence of voiding symptoms. For the tests, both univariate and multivariate analysis, a significance level of 5% was considered.

RESULTS

Clinical-demographic profile

Among the 149 patients included in the research, 81.9% were successfully treated (n = 122). Among these, 69.7% (n = 85) were male, and 30.3% (n = 37) were female. The average age was 43.01 years (± 12.76). In the first age group, 48.4% were classified (n = 59) and in the second, 51.6% (n = 63). Among the patients, 95.9% (n = 117) had not undergone a previous transplant, 49.2% (n = 60) were transplanted in Porto Velho, and 53.5% (n = 64) received an organ from a deceased donor.

Regarding those approached, 89.3% (n = 109) stated that they do not smoke and 79.5% (n = 97) that they do not drink alcoholic beverages. Among smokers, the average number of months of cigarette use was 98.5 (± 67.95). Among alcohol drinkers, the average was 143.91 months (± 98.7). The prevalence of comorbidities in the sample was also assessed from the questionnaire: 75.4% (n = 92) stated they had some. The responses regarding the presence of comorbidity were summarized in Table 1.

Table 1. Prevalence of comorbidities presented by patients.

Comorbidity	Prevalence %(n)
Systemic arterial hypertension	73.9 (68)
Diabetes *mellitus*	27.2 (25)
Visual deficit	26.1 (24)
Cardiac insufficiency	8.7 (8)
Myocardial infarction	0.0 (0)
Others	19.5 (18)
	100.0 (143)

Source: Prepared by the authors.

The average between the date of transplantation and the research was 66.44 months (± 56.54). The average time spent on pre-transplant dialysis was 36.66 (± 30.83). The underlying etiology of chronic kidney disease (CKD) in transplant recipients is summarized in Table 2:

Table 2. Etiology of CKD.

Comorbidity	Prevalence %(n)
Systemic arterial hypertension	19.0 (23)
Diabetes *mellitus*	10.7(13)
Polycystic kidneys	5.8 (7)
Glomerulopathies	9.9 (12)
Urological	0.0 (0)
Unknown	34.7 (42)
Others	19.0 (23)
Total	100.0 (120)*

Source: Prepared by the authors. *In two patients in the sample, there was a loss of data on this variable.

In only 20.5% (n = 25) of patients, there was data on post-void residue certified by ultrasound, the average of which was 27.34 mL (± 64.54), and only 8% (n = 2) had residue greater than 100 mL, which suggests voiding dysfunction. It was also possible to find the serum creatinine value in 121 of the 122 patients studied, which ranged from 0.6 to 3.4 mg/dL [average of 1.51 mg/dL (± 0.59)]. The presence of urinary fistula after kidney transplantation was not answered or found in the records in 36.6% (n = 47). Among the remaining patients (63.4%; n = 75), 90.7% (n = 68) did not report the presence of a fistula.

Among induction immunosuppressive medications, thymoglobulin was used in 27% of patients (n = 33), in 16.5% basiliximab (n = 20) and in 56.5% (n = 69) of medical records it was not possible find this information. Among maintenance treatments, the most used was prednisone (95.1%; n = 116), followed by tacrolimus (87.7%; n = 107) and mycophenolate sodium (82.8%; n = 101). In addition to these, azathioprine (13.1%; n = 16), cyclosporine (9.8%; n = 12) and others (3.3%; n = 4) were also used, but in smaller quantities. Among the most commonly used regimens, the most prevalent association in the researched outpatient clinic was between tacrolimus, prednisone and mycophenolate (70.5%; n = 86), followed by the regimen consisting of tacrolimus, prednisone and azathioprine (9%; n = 11) and by the compound of prednisone, cyclosporine and sodium mycophenolate (6.6%; n = 8). Other schemes represented 14% (n = 17).

In the group of patients studied, 76.2% (n = 93) had at least one episode of cytomegalovirus (CMV) infection during the post-transplant period. Of these, 46.2% (n = 43) had at least one episode of infection caused by this agent, while 53.8% (n = 50) did not.

Analysis of questionnaires

The OAB-V8 score ranged from 0 to 26 points since the maximum value was 40 points. The mean score was 6.46 (± 5.79), and 32.6% (n = 44) of patients had a score greater than or equal to 8 points, which suggests the possibility of overactive bladder symptoms. Of the total number of patients, 59% (n = 72) had increased urinary frequency, 71.3% (n = 87) had nocturia, and up to 35% (n = 42) had urinary urgency.

Regarding the ICIQ-SF questionnaire, which assesses urinary incontinence, the score ranged from 0 to 17 points, with the maximum possible being 18 points and the average being 0.97 (± 3.13). Because they did not report involuntary loss of urine, 87.7% (n = 107) did not score in this questionnaire. Six (4.9%) patients scored from 1 to 6 points, which represents mild to moderate impact; 2.5% (n = 3) scored from 7 to 9 points, suggesting severe impact, and 4.9% (n = 6) scored 10 points or more, which implies a very serious impact on the patient's quality of life.

As for the IPSS, the score ranged from 0 to 31 points since the maximum possible value in this questionnaire is 35 points. The average score was 8.03 (± 5.64). In 55.7% (n = 68) of patients, symptoms are mild (0 to 7 points), and in 40.2% (n = 49) they are moderate (8 to 19 points). The greatest severity of symptoms (20 to 35 points) was observed in a minority of 4.1% (n = 5) of patients. As the most prevalent symptoms, we found increased frequency and nocturia, presenting 68.2% (n = 83) and 97.6% (n = 117), respectively.

The results found regarding the scores and the categorized subgroups are presented in Table 3.

Table 3. Score from the OAB, IPSS, ICIQ questionnaires and distribution between stratification groups (n = 122).

Questionnaires and subgroups	Patients %(n)	Average score	Standard deviation
OAB			
Group 01	63.9 (78)	6.5	5.8
Group 02	36.1 (44)		
ICIQ			
Group 00	87.7(107)	1.5	4.7
Group 01	4.1 (5)		
Group 02	0,8 (1)		
Group 03	2.5(3)		
Group 04	4.9 (6)		
IPSS			
Group 01	55.7 (68)	8.0	5.6
Group 02	40.2 (49)		
Group 03	4.1(5)		

Source: Prepared by the authors.

Analysis of pre-transplant factors

The ANOVA test was used to establish the presence of an association between categorical variables and the questionnaire scores. The statistically significant relationships were alcohol use (p = 0.001) and heart failure (p = 0.009) associated with the OAB-V8 score. Patients over 40 years old (0.014) and heart failure (p = 0.003) are associated with the ICIQ-SF score. In the analysis of the other variables, there were no results within the confidence interval.

The chi-square test was used to compare subgroups of the same questionnaire, relating all variables studied. There was only one statistically significant difference between OAB groups 1 and 2 in relation to alcoholism (p = 0.005). Finally, multivariate logistic regression was used to test the association of the variables dialysis time, smoking time and alcohol consumption time with the

questionnaire scores. Despite some Pearson coefficients suggesting correlation for OAB, IPSS, and ICIQ, no statistical significance was found in any data crossing.

Analysis of peritransplant factors

When checking variance in relation to the origin of the graft (living or deceased donor) and delayed graft function, the analysis with the means of the questionnaires did not demonstrate a statistically significant difference. The analysis evaluated induction immunosuppressants with questionnaire scores, finding an association between thymoglobulin and the OAB-V8 questionnaire score ($p = 0.009$). Still, regarding the ANOVA statistical test, evaluating the means of the questionnaires and using a double-J ureteral catheter, there was a statistical difference ($p = 0.014$) when associated with the OAB-V8 questionnaire.

According to Pearson's correlation coefficient, used to verify the relationship between the renal graft ischemia time and the questionnaires applied, the analysis between the ischemia time and the ICIQ-score questionnaire obtained a positive correlation (0.226) with statistical significance. ($p = 0.040$), that is, the longer the ischemia time, the higher the mean ICIQ score, suggesting a greater prevalence of urinary loss.

Analysis of post-transplant factors

When Pearson's linear regression test was performed between serum creatinine and scores from the IPSS ($p = 0.265$), OAB-V8 ($p = 0.131$) and ICIQ-SF ($p = 0.364$) questionnaires, no statistically significant correlations were found. There were also no statistically significant associations found by the ANOVA test between the presence of post-transplant urinary fistula and the questionnaire scores.

The analysis using the ANOVA test evaluated all maintenance immunosuppressants separately, with the questionnaire scores finding no association. When testing the association between maintenance immunosuppressive regimens and scores on the IPSS, OAB-V8 and ICIQ-SF questionnaires, only the prednisone, cyclosporine and mycophenolate sodium regimen had a statistically significant association with the ICIQ-SF questionnaire ($p = 0.044$).

Finally, the ANOVA test performed between the occurrence of CMV infection and the questionnaire scores showed a statistically significant association with the IPSS ($p = 0.008$) and OAB-V8 ($p = 0.031$) questionnaire scores. No significant association was found for the ICIQ-SF ($p = 0.267$).

The significant findings by the ANOVA test are described in Table 4.

Table 4. Significant associations demonstrated by the ANOVA test.

Questions	Variable	N	Average score	Confidence interval 95%		P
	Alcoholism					
OAB-V8	No	97	7.35	6,17	8,53	0,001
	Yes	25	3.00	1,29	4,71	
	Cardiac insufficiency					
OAB-V8	No	114	6.10	5,09	7,10	0,009
	Yes	08	11.63	4,49	18,7	
	Age group					
ICIQ-SF	01(<40 years)	59	0.25	-0,1	1,21	0,014
	02(>40 years)	63	1.63	0,9	3,9	
	Cardiac insufficiency					
ICIQ-SF	No	114	0.75	0,26	1,23	0,003
	Yes	08	4,13	-1,6	9,87	
	Pred + Ciclo + Micof					
ICIQ-SF	No	114	0,82	0,29	1,34	0,044
	Yes	08	3,13	-1,7	7,97	
	CMV infection					
I-PSS	No	50	9,74	7,72	11,76	0,008
	Yes	43	6,49	5,43	7,54	
	CMV infection					
OAB-V8	No	50	8.10	6,32	9,88	0,031
	Yes	43	5.42	3,75	7,08	
	Double J catheter					
OAB-V8	Yes	33	3,91	2,23	5,58	0.014
	No	58	7,36	5,75	8,97	
	Thymoglobulin					
OAB-V8	Yes	85	5,56	4,47	6,65	0,009
	No	37	8,51	6,23	10,80	

Source: Prepared by the authors.

DISCUSSION

The prevalence of LUTS symptoms in the general population varies between studies, and values suffer relevant differences when stratification is based on gender, age, and other epidemiological factors. In Brazil, the occurrence of symptoms suggestive of BHS is estimated at values close to 19%, regardless of gender[9]. In turn, symptoms of benign prostatic hyperplasia (BPH) present a prevalence of 20 to 50% in Brazilian and North American cross-sectional studies, reaching 80% in patients over 80 years of age[10-12]. According to the systematic review by Coyne et al.[13], urinary incontinence occurs in up to 9% of men and 25% of women, varying values depending on the methodology used in the research and the sample chosen.

In kidney transplant recipients, these complaints seem more frequent. However, few studies evaluate the prevalence of dysfunctions in this population. In work carried out by Ferreira[3] with 28 transplant patients in Portugal, 85.7% showed some symptoms of LUTS. Using the IPSS questionnaire, we observed that 84.4% (n = 103) had a score greater than 3 points, suggesting some urinary symptoms. However, based on data from the OAB-V8 questionnaire, the discomfort of overactive bladder symptoms is only felt by 32.6% (n = 44). This fact also agrees with Ferreira[3], who mentions that, despite being present, the symptoms do not seem to affect the patient's quality of life.

Among the pre-transplant variables studied, we found statistically significant factors for LUTS: alcohol use, presence of heart failure and age over 40 years. The association found between the age group and the ICIQ score is not an unexpected finding since this result is also found in the literature, confirming the considerably higher occurrence of LUTS symptoms in the age group of 40 years or more, mainly in men[14]. This increase is often attributed, in men, to prostate enlargement and, in women, to multiparity.

The use of alcohol by transplant patients is less prevalent than in the general population and does not present significant risks, according to the literature[15]. Among the significant findings of the statistical analysis carried out, we observed that patients who reported drinking alcohol had a lower score on the OAB questionnaire. Although, at first, it seems like a controversial finding, a systematic literature review on the impact of fluid intake on the diagnosis and worsening of LUTS symptoms corroborates our finding, pointing to alcohol as a possible factor in reducing LUTS symptoms, as well as diagnosis of BPH[16].

The chi-square result suggests a greater proportional consumption of alcohol in patients who fall into subgroup 01 of OAB, stratified as the absence of overactive bladder. Once again, in addition to what has already been demonstrated by ANOVA, this finding confirms the discussion about the use of alcohol as a possible protective factor in the occurrence of urinary dysfunction. It is, without a doubt, a point that needs to be better worked on in non-observational studies to prove it with greater confidence.

Regarding heart failure, the statistical analysis demonstrated a correlation between this comorbidity and the OAB and ICIQ scores, confirming what has already been observed in other published studies. Patients with this disease have a higher prevalence of storage-voiding symptoms and overactive bladder. The greater the degree of insufficiency, the greater the occurrence of these symptoms[17]. The reason why these factors are associated is not well known and should be the subject of future studies on the topic.

Most of the peritransplant variables analyzed could not be interpreted as statistically significant predictive factors for LUTS, with the exception of the use of double J catheter and graft ischemia time. It is a fact that the use of a double J ureteral catheter in kidney transplant surgery has been associated with a reduction in urological complications. However, the study by Oliveira et al.[18] demonstrated that the double J catheter in transplant surgery had no impact on the frequency of urinary fistula but was associated with a 2.98 times greater chance of developing UTI when compared to the group that did not use double J. In this aspect, taking into account that, in our sample, those who used a catheter had more urinary symptoms, it is possible that there is a relationship between these and the higher risk of UTI.

Regarding the relationship between ischemia time and the ICIQ-score questionnaire, no specific studies have addressed these variables. However, the literature points to longer ischemia time and the use of a deceased donor graft as risk factors for the occurrence of UTI and delayed graft function, which may have some unexplored relationship with the occurrence of urinary incontinence[19,20].

On the other hand, CMV infection and the immunosuppressive regimen used in the service are post-transplant variables that need to be highlighted. After the transplant, so that rejection between the recipient and the graft is avoided or minimized so that the transplant is a success, patients are prescribed a regimen of immunosuppressive medications to be taken correctly, as prescribed, following schedules, guidelines and care[21].

It is important to highlight that medications, as are doses, are chosen individually for each patient according to needs and acceptance. The main maintenance immunosuppressants used in clinical practice are prednisone, tacrolimus, cyclosporine, mycophenolate and azathioprine, generally combined in a triple regimen, as performed in the Porto Velho outpatient clinic. Tizo & Macedo[22] emphasize that these medications bring different side effects to patients in different locations. Because we believe that immunosuppressants are an important variable post-transplant, we assume it may be a risk factor associated with voiding symptoms. We did not find other studies in the literature that involve this association.

According to Scheffel et al.[23], CMV infection occurs mainly in the first 3 months after transplantation; it is estimated that 50 to 80% develop active infection with the virus. In our group of patients, we found that 46.2% had at least one episode of infection. CMV represents the main infectious complication in kidney transplantation, causing high morbidity and mortality[24]. The occurrence of CMV infection proved to be a statistically significant protective factor for the occurrence of urinary symptoms in our sample. In a literature review, only one study evaluated this variable in urinary symptoms, finding a slight positive association between CMV infection and LUTS, the opposite of what was observed in our study[25]. Furthermore, no other study has provided results regarding this relationship. We hypothesize that there is some relationship between urinary symptoms and the antivirals used to treat cytomegalovirus. It is also worth noting that these patients were evaluated more frequently and had their immunosuppressive regimen adjusted more times, which may have influenced our findings.

The results discussed point to the need to expand studies on the topic, including carrying out prospective and multicenter studies, since these are scarce and have not yet clarified important points, such as, for example, confirming factors related to transplantation as predictors for the occurrence of urinary dysfunctions. The weak points of this work include the low number of the sample studied and the fact that it is a single transplant center, which can be limiting in the absence of observation of other predictive factors and does not faithfully represent reality. Another limitation of the study would be the fact that the patients did not undergo urological examinations, such as urodynamic studies, particularly diabetics. Likewise, questionnaire analyses were not adjusted for renal function and CKD etiology. As positive points, we highlight the choice of this topic, which is still little explored in the literature, the use of questionnaires validated for the Portuguese language, and the performance of descriptive and associative statistical analysis, with the crossing of individual and grouped variables, strengthening the confidence of the data worked on.

CONCLUSION

The prevalence of LUTS symptoms is higher in kidney transplant recipients than in the general population. These symptoms occur more in the group of patients over 40 years of age, and the most frequent are increased urination frequency and nocturia. Systemic arterial hypertension is the main etiology of CKD that led to transplantation. These findings are in agreement with current literature on the topic. In addition to age, the presence of heart failure, graft ischemia time, use of double J catheter, use of thymoglobulin as induction and triple maintenance immunosuppressant regimen (prednisone, cyclosporine and sodium mycophenolate) demonstrates to be predictive factors for the occurrence of urinary dysfunction. In contrast, alcohol use and CMV infection appear to be protective factors against these symptoms. The occurrence of LUTS in kidney transplant recipients and its associated factors are still little studied and deserve further research with greater methodological rigor.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Sobrinho DHG, Tomaz KJS, Schwamback GR, Gonçalves RS, Prudente A; **Conception and design:** Prudente; **Data analysis and interpretation:** Sobrinho DHG, Tomaz KJS, Schwamback GR, Gonçalves RS, Prudente A; **Article writing:** Sobrinho DHG; **Critical revision:** Sobrinho DHG, Prudente A; **Final approval:** Prudente A.

DATA AVAILABILITY STATEMENT

Data will be available upon request.

FUNDING

Not applicable.

ACKNOWLEDGEMENT

Not applicable.

REFERENCES

1. Xavier JMRP, Jesus TD, Andrade MC, Rezende AJB, Santos KM, Ambrósio BM, et al. Comparação entre o número de transplantes de órgãos sólidos e tecidos realizados no brasil durante o primeiro semestre de 2019 e 2020. Braz J Health Rev. 2021;4(2):6214-23. https://doi.org/10.34119/bjhrv4n2-176
2. Garcia VD. Dimensionamento dos transplantes no Brasil e em cada estado (2015-2022). Registro Brasileiro de Transplantes. 2022 [08 Jan 2024];XXIX(4):3. Retrieved from: https://site.abto.org.br/wp-content/uploads/2023/03/rbt2022-naoassociado.pdf
3. Ferreira SRFG. Disfunção do aparelho urinário baixo em doentes transplantados renais e influência de fatores pré-transplante. Porto. Dissertação [Mestrado Integrado em Medicina] – Universidade do Porto; 2012 [08 Jan 2024]. Retrieved from: https://repositorio-aberto.up.pt/bitstream/10216/66040/2/30572.pdf
4. Rodrigues NS, Martins G, Silveira AO. Family experience of living with children and adolescents with bladder and bowel dysfunction. Rev Bras Enferm. 2020;73 Suppl 4. https://doi.org/10.1590/0034-7167-2019-0805
5. Indra W, Harrina ER. Factors associated with postoperative voiding dysfunction post renal transplantation. *Transplant Proc*. 2020;52(10):3197-3203. https://doi.org/10.1016/j.transproceed.2020.04.1817
6. Mitsui T, Moriya K, Morita K, Iwami D, Kitta T, Kanno Y, et al. Risk factors for lower urinary tract dysfunction and symptoms after successful renal transplantation. *Ann Transplant*. 2015;24(20):757-63. https://doi.org/10.12659/AOT.895515
7. Chuang P, Parikh CR, Langone A. Urinary tract infections after renal transplantation: a retrospective review at two US transplant centers. Clin Transplant. 2005;19(2):230-5. https://doi.org/10.1111/j.1399-0012.2005.00327.x
8. Pellé G, Vimont S, Levy PP, Hertig A, Ouali N, Chassin C, et al. Acute pyelonephritis represents a risk factor impairing long-term kidney graft function. *Am J Transplant*. 2007;7(4):899-907. https://doi.org/10.1111/j.1600-6143.2006.01700.x
9. Boaretto JA, Mesquita CQ, Lima AC, Prearo LC, Girão MJBC, Sartori MGF. Comparação entre oxibutinina, eletroestimulação do nervo tibial posterior e exercícios perineais no tratamento da síndrome da bexiga hiperativa. Fisioter Pesqui. 2019;26(2):127-36. https://doi.org/10.1590/1809-2950/17020026022019
10. Lee SWH, Chan EMC, Lai Y. The global burden of lower urinary tract symptoms suggestive of benign prostatic hyperplasia: a systematic review and meta-analysis. Sci Rep. 2017;7:7984. https://doi.org/10.1038/s41598-017-06628-8
11. Egan KB. The epidemiology of benign prostatic hyperplasia associated with lower urinary tract symptoms. *Urol Clin North Am*. 2016;43(3):289-97. https://doi.org/10.1016/j.ucl.2016.04.001
12. Almeida LS, Faria RS, Cordeiro PM, Oliveira MBS, Pereira RMO, Araujo VSC, et al. Hiperplasia prostática e os principais sintomas do aparelho genito-urinário na população masculina de Coari – Amazonas, Brasil. Revista Eletrônica Acervo Saúde. 2020;12(8). https://doi.org/10.25248/reas.e3360.2020
13. Coyne KS, Wein A, Nicholson S, Kvasz M, Chen CI, Milsom I. Comorbidities and personal burden of urgency urinary incontinence: a systematic review. Int J Clin Pract. 2013;67(10):1015-33. https://doi.org/10.1111/ijcp.12164.
14. De Ridder D, Roumeguère T, Kaufman L. Urgency and other lower urinary tract symptoms in men aged ≥ 40 years: a Belgian epidemiological survey using the ICIQ-MLUTS questionnaire. Int J Clin Pract. 2015;69(3):358-65. https://doi.org/10.1111/ijcp.12541
15. Fierz K, Steiger J, Denhaerynck K, Dobbels F, Bock A, De Geest S. Prevalence, severity and correlates of alcohol use in adult renal transplant recipients. Clin Transplant. 2006;20(2):171-8. https://doi.org/10.1111/j.1399-0012.2005.00460.x
16. Bradley CS, Erickson BA, Messersmith EE, Pelletier-Cameron A, Lai HH, Kreder KJ, et al. Evidence of the impact of diet, fluid intake, caffeine, alcohol and tobacco on lower urinary tract symptoms: a systematic review. J Urol. 2017;198(5):1010-20. https://doi.org/10.1016/j.juro.2017.04.097
17. Chiu AF, Liao CH, Wang CC, Wang JH, Tsai CH, Kuo HC. High classification of chronic heart failure increases risk of overactive bladder syndrome and lower urinary tract symptoms. Urology. 2012;79(2):260-5. https://doi.org/10.1016/j.urology.2011.10.020
18. Oliveira CMC, Cerqueira JBG, Santos DCO, Mota MU, Andrade SA, Girão ES, et al. Infecção urinária pós-transplante renal e uso de cateter ureteral duplo J. Braz J Transplant. 2011;14(4):1598-602. https://doi.org/10.53855/bjt.v14i4.214
19. Sousa SR, Galante NZ, Barbosa DA, Pestana JOM. Incidência e fatores de risco para complicações infecciosas no primeiro ano após o transplante renal. J Bras Nefrol. 2010;32(1):77-84. https://doi.org/10.1590/S0101-28002010000100013
20. Baptista APM, Silva Junior HT, Pestana JOM. Influence of deceased donor hemodynamic factors in transplant recipients renal function. J Bras Nefrol. 2013;35(4):289-98. https://doi.org/10.5935/0101-2800.20130048

21. Pozza BP, Farias JS, Farias L, Feijó AM, Viegas AC, Schwartz E. Utilização das medicações imunossupressoras pelas pessoas com transplante renal. Rev Pesqui. 2017;9(4):1145-53.

22. Tizo JM, Macedo LC. Principais complicações e efeitos colaterais pós-transplante renal. *UNINGÁ Rev.* 2015;24(1):62-70.

23. Scheffel TB, Schroeder RB, Keitel E, Neumann JM, Weber LP. Infecção citomegálica pós-transplante renal. Braz J Transplant. 2024;18(1):16-25. https://doi.org/10.53855/bjt.v18i1.122

24. Requião-Moura LR, Matos ACC, Pacheco-Silva A. Cytomegalovirus infection in renal transplantation: clinical aspects, management and the perspectives. Einstein (São Paulo). 2015;13(1):142-8. https://doi.org/10.1590/S1679-45082015RW3175

25. Sutcliffe S, Rohrmann S, Giovannucci E, Nelson KE, De Marzo AM, Isaacs WB, et al. Viral infections and lower urinary tract symptoms in the Third National Health and Nutrition Examination Survey. J Urol. 2007;178(5):2181-5. https://doi.org/10.1016/j.juro.2007.06.041