

## BÖBREK NAKLİ SONRASI ÜRİNER SİSTEM ENFEKSİYONLARI RİSK FAKTÖRLERİNİN BELİRLENMESİ: RETROSPEKTİF ANALİZ

**Dilek SOYLU**

Doktor Öğretim Üyesi, Kahramanmaraş Sütçü İmam Üniversitesi, Afşin Sağlık Yüksekokulu, Hemşirelik Bölümü, soyludilek2009@gmail.com, Kahramanmaraş/Türkiye, 0000-0002-9580-3804

**Ayşe SOYLU**

Doktor Öğretim Üyesi, Kahramanmaraş Sütçü İmam Üniversitesi, Sağlık Hizmetleri Meslek Yüksekokulu, Anestezi Bölümü, aysesoylu46@gmail.com, Kahramanmaraş/Türkiye, 0000-0001-9800-2108

### Öz

Bu çalışma böbrek nakli sonrası idrar yolu enfeksiyonu risk faktörlerini belirlemek amacıyla yürütülmüştür. Retrospektif ve tanımlayıcı bir çalışma olarak tasarlanmıştır. Çalışma 99 hastadan alınan verilerle tamamlanmıştır. Yaş, cinsiyet, nakil yılı, kronik hastalıklar, nakil tipi, greft kaybı, hastanede kalış süresi, laboratuvar sonuçları, diyaliz süresi, DJ (double J) kateter süresi, antibiyotik kullanımı, steroid ve immünosüpresif ilaç dozları hasta dosyalarında ve hastane bilgi sistemi kayıtlarında araştırılmıştır. Hastaların %48,5'i 19 gün veya daha uzun süre hastanede yatmış, %47,5'i 6 mg'dan fazla prednizon kullanmış, %98,0'ı çift immünosüpresan kullanmış ve %19,2'si ek bir cerrahi prosedür geçirmiştir. Hastalarda DJ kateter kalış süresi  $44,22 \pm 26,46$  gün olmuştur. Ameliyat sonrası idrar kültürü %4'ünde 7. günde, %6.1'inde 14. günde, %11.1'inde 1. ayda, %12.1'inde 3. ayda ve %11.1'inde 6. ayda enfeksiyon üredi. Hastaların ameliyat sonrası 1. günde %47.5'inin, 3. günde %68.7'sinin ve 7. günde %51.5'inin CRP düzeylerinin  $\geq 5$ mg/l olduğu bulundu. Hastaların ameliyat sonrası 1. günde %27.3'ünün, 3. günde %31.3'ünün, 7. günde %37.4'ünün prokalsitonin düzeylerinin  $\geq 0.25$  ng/mL'nin üzerinde olduğu saptandı. Yaş, cinsiyet, kronik hastalıklar, DJ kateter süresi, diyaliz süresi, hastanede kalış süresi ve kullanılan immünosüpresif ilaç sayısı İYE gelişimi için risk faktörleri arasındadır.

**Anahtar Kelimeler:** Böbrek Nakli, İdrar Yolu Enfeksiyonu, Hemşire

## DETERMINATION of URINARY SYSTEM INFECTIONS RISK FACTORS AFTER KIDNEY TRANSPLANTATION: RETROSPECTIVE ANALYSIS

### Abstract

This study was conducted to determine the risk factors of urinary tract infection after kidney transplantation. It was designed as a retrospective and descriptive study. The study was completed with data from 99 patients. Age, gender, year of transplantation, chronic diseases, transplant type, graft loss, length of hospital stay, laboratory results, dialysis duration, DJ (double J ) catheter duration, antibiotic use, steroid and immunosuppressive drug doses were investigated in patient files and hospital information system records. 48.5% of the patients were hospitalised for 19 days or longer, 47.5% used more than 6 mg prednisone, 98.0% used double immunosuppressants and 19.2% had an additional surgical procedure. The duration of DJ catheter stay was  $44.22 \pm 26.46$  days. Postoperative urine culture produced infection on the 7th day in 4%, 14th day in 6.1%, 1st month in 11.1%, 3rd month in 12.1% and 6th month in 11.1%. CRP levels were found to be  $\geq 5$ mg/l in 47.5% of the patients on postoperative day 1, 68.7% on postoperative day 3 and 51.5% on postoperative day 7. Procalcitonin levels were found to be  $\geq 0.25$  ng/mL in 27.3% of the patients on postoperative day 1, 31.3% on postoperative day 3, and 37.4% on postoperative day 7. Age, gender, chronic diseases, duration of DJ catheter, duration of dialysis, duration of hospital stay and number of immunosuppressive drugs used are among the risk factors for the development of UTI.

**Keywords** Kidney transplant, urinary tract infection, nurse.

## 1. INTRODUCTION

Kidney transplantation (KT) improves overall survival and quality of life compared with chronic dialysis. However, complications that worsen the outcome of transplantation are a major concern. Infection is a common problem in patients receiving immunosuppressive therapy after transplantation (1). As the general inflammatory response is suppressed in patients, infection is diagnosed late and simultaneous or sequential infections may occur. Urinary tract infection (UTI) develops in 35-80% of patients after kidney transplantation. UTI is the most common complication in the first three months after transplantation. In addition, UTI is a common cause of bacteraemia and sepsis during this period. This situation is one of the major causes of morbidity and mortality after kidney transplantation (2).

Risk factors for the development of UTI after KTx include prolonged hospital stay, high body mass index (BMI), female sex, ureteral stenting, vesicoureteral reflux (VUR), neurogenic bladder, older age, diabetes and duration of permanent urinary catheterisation. In addition, duration of haemodialysis, cadaveric transplantation, recurrent UTI before transplantation, induction therapy (anti-thymocyte globulin or basilix-imab) and cytomegalovirus infection are important risk factors for UTI (1)(3,4). In the first 6 months after transplantation, serum creatinine levels >2mg/dL and prednisone doses >20mg/dL are important risk factors for UTI (4). In addition to all these, functional and anatomical abnormalities (stones, urodynamic disorders, impaired bladder function, obstructive uropathy), urethral reflux and ureterovesical stenosis are also causes of recurrent urinary tract infections (2,5).

Nurses are the primary healthcare professionals who are responsible for the insertion and monitoring of urinary catheters (6). In nursing care, UTI management should begin in the pre-transplant preparation phase and continue throughout the patient's clinical and home care. Nursing responsibilities and priorities include comprehensive patient education on the symptoms and signs of UTI, prevention of recurrence, and early diagnosis and treatment during discharge education (7). Without timely prevention and control, UTIs can affect the function of kidney transplants, increase the difficulty of treatment and the risk of death, and put enormous psychological and economic pressure on patients and their families (8). For this reason, nurses have a major role and contribution to make in the prevention of urinary tract infections (6).

This study was designed to retrospectively analyse the risk factors for UTI in post-transplant patients. This study can provide a scientific and reliable nursing solution for the prevention and control of early UTI after kidney transplantation, which is extremely important for guiding clinical nursing studies.

1. What are the risk factors for UTI in kidney transplant patients?
2. To what extent do the patient's risk factors for UTI influence the risk of infection?

## 2. METHODS

### Ethical aspect of the study

The study was approved by the Clinical Research Ethics Committee of Kahramanmaraş Sütçü İmam University Faculty of Medicine (date: 01.11.2022, number: 2022/31, decision number: 16) and the Chief Physician of the hospital.

### Type of research

This study was designed as a retrospective and descriptive study.

### Place and time of research

This study was conducted between 5 November and 5 December 2022 to determine the risk factors for UTI in kidney transplant patients followed in a public hospital organ transplant centre.

### Study population and sample

The study population consisted of patients who received a kidney transplant between 2009 and 2022. The study sample consisted of 99 patients whose patient information was accessible through archive scanning.

### Data collection

Age, gender, year of transplantation, chronic diseases, type of transplantation, graft loss, length of hospital stay, high creatinine, dialysis duration, DJ catheter duration, antibiotics used, WBC, CRP, procalcitonin, steroid and immunosuppressive medication were recorded in the medical records and in the hospital information system. Doses, urine culture, growing microorganisms, infectious disease status, additional surgical interventions and patient status information were retrospectively reviewed.

### Statistical analysis

Statistical analysis of the data was performed using the statistical package SPSS 21.0. Number, percentage, minimum, maximum, mean and standard deviation were used to evaluate the data.

## 3. RESULTS

The sociodemographic and clinical characteristics of the patients are given in Table 1. The average age of the patients participating in the study was  $42.15 \pm 13.43$ . 50.5% of the patients are under the age of  $\leq 40$ , 41.4% are women, and 97.0% have a chronic disease. 33.3% of the patients had HT, 64.6% had a cadaver transplant, and 90.9% had no graft loss. 48.5% of the patients were hospitalized for 19 days or more, 47.5% were using more than 6 mg of prednol, 19.2% had high creatinine levels, 98.0% were using dual immunosuppressives, 19.2% had extra surgical intervention, and 14.1% of the patients died (Table 1). The hospital stay was  $21.59 \pm 16.73$  days and the dialysis duration was  $5.59 \pm 5.09$  years.

**Table 1. Sociodemographic and Clinical Characteristics of The Patients (n=99)**

Variables	n	%
Age	$\leq 40$	50
	$\geq 41$	49
Gender	Female	41
	Male	58
Presence of chronic disease	There exists	96
	None	3
Chronic illness	DM	17
	HT	33
	Nephrolithiasis	3
	Wegener	1
	Nephrotic syndrome	4
	VUR	2
	LUPUS	1
	Polycystic kidney	2
Type of Transplant	Live	35
	Cadaver	64
Graft loss	Existent	9
	None	90
Length of stay in hospital	$\leq 18$ days	51
	$\geq 19$ days	48

Dose of prednisol used	≤5 mg	52	52.5
	≥6 mg	47	47.5
Creatinine value	High	19	19.2
	Low	80	80.8
Type of immunosuppressive used	2	97	98
	3	2	2
Extra surgical intervention	Yes	19	19.2
	No	80	80.8
Patient's last condition	Alive	85	85.9
	Died	14	14.1

Characteristics of the patients regarding their urinary tract infection risk factors are given in Table 2. DJ catheter residence time in patients was  $44.22 \pm 26.46$ . Postoperative urine culture was found to be positive in 4% of the patients on the 7th day, 6.1% on the 14th day, 11.1% in the 1st month, 12.1% in the 3rd month, and 11.1% in the 6th month. It was determined that 47.5% of the patients' postoperative CRP levels were  $\geq 5\text{mg/l}$  1th day, 68.7% 3th day, and 51.5% 7th day. It was determined that 27.3% of the patients' postoperative procalcitonin levels were above  $\geq 0.25\text{ ng/mL}$  1th day, 31.3% 3th day, and 37.4% 7th day. When the postoperative WBC results of the patients were examined, it was determined that 29.3% 1th day, 46.5% 3 th day, and 30.3% 7 th day were  $\geq 11.00$  (Table 2).

**Table 2. Characteristics of Patients Regarding Urinary Tract Infection Risk Factors (n=99)**

Variables		n	%
Double j catheter duration	≤41 days	54	54.5
	≥42 days	45	45.5
7th day urine growth	No reproduction	95	96.0
	Reproduction available	4	4.0
14th day urine growth	No reproduction	93	93.9
	Reproduction available	6	6.1
1th month urine growth	No reproduction	89	89.9
	Reproduction available	10	11.1
3rd month urine growth	No reproduction	86	86.9
	Reproduction available	13	12.1
6th month urine growth	No reproduction	88	88.9
	Reproduction available	11	11.1
CRP Day 1	<5mg/l	63	52.5
	≥5mg/l	37	47.5
CRP Day 3	<5mg/l	31	36.3
	≥5mg/l	68	68.7
CRP Day 7	<5mg/l	49	48.5
	≥5mg/l	51	51.5
Procalcitonin Day 1	<0.25 ng/mL	73	73.7
	≥0.25 ng/mL	27	27.3
Procalcitonin Day 3	<0.25 ng/mL	68	68.7
	≥0.25 ng/mL	32	31.3
Procalcitonin Day 7	<0.25 ng/mL	62	62.6
	≥0.25 ng/mL	38	37.4
WBC Day 1	<11.00	71	71.7
	≥11.00	29	29.3
WBC Day 3	<11.00	54	53.5
	≥11.00	46	46.5
WBC Day 7	<11.00	71	69.7
	≥11.00	29	30.3

#### 4. DISCUSSION

UTI is associated with acute cellular rejection, impaired allograft function, allograft loss and death (9). Therefore, nurses need to identify risk factors for UTI after renal transplantation and plan nursing care accordingly.

Kazımoğlu et al (2019) found more infections in female patients than male patients in the first year after renal Tx. The frequency of infection was found to increase with age, with more infections found in older patients (10). Yüksel and Akkoç (2022) found that female gender and prolonged hospital stay following transplantation were associated with developing UTI (11). Alangaden et al (2006) found that female gender, urinary catheters, DM, allograft trauma and UTI, and transplantation before long-term dialysis had no effect on the development of UTI, but ureteral stenting and retransplantation were the only strong determinants of UTI (12). In this study, 50.5% of the patients were younger than 40 years, 41.4% were female and 97.0% had a chronic disease. In addition, in this study, the duration of DJ catheter stay was  $44.22 \pm 26.46$  days, the duration of hospital stay was  $21.59 \pm 16.73$  days, and the duration of dialysis was  $5.59 \pm 5.09$  years.

Feber et al (2009) found that despite prophylactic antibiotic treatment, UTI occurred in 28% of patients in the first year after transplantation and that a diagnosis of obstructive uropathy, a history of UTI and VUR before transplantation were important risk factors for the development of UTI (13). Khosravi et al (2014) reported in their study that the incidence of UTI increased in kidney transplant recipients with high antibiotic resistance (14). Another study showed that infections were more common in diabetic patients after renal Tx (10). In this study, 97% of the patients had a chronic disease, and 4% on day 7 after surgery, 6.1% on day 14, 11.1% on month 1, 12.1% on month 3, 11.1% on month 6. It was noted that there was growth in the urine culture. In addition, 17.2% of patients had DM and 2% had VUR. The results of this study are in line with the literature.

Yüksel and Akkoç (2022) found that immunosuppressive treatment had no effect on the development of UTI. In addition, the researchers in the study found that the patients' creatinine results at 1 month, 1 year, and 2 years had no effect on the development of UTI (11). Esezobor et al (2012) found that approximately half of their patients had their first UTI within the first 6 months after KTx. This may be due to the intensity of immunosuppression in the early post-KTx period, as well as the increased likelihood of urological intervention (15). In this study, it was found that 47.5% of the patients were using more than 6 mg of prednol, 98.0% were on dual immunosuppressants and 19.2% had additional surgical procedures. In addition, this study found that 19.2% of patients had high creatinine levels. Differences in the results of the trials may be due to differences in treatment between the centres where the trials were conducted.

Urinary complications such as urine leakage, vesicoureteral reflux, stenosis and ureteral obstruction are common after transplantation. To prevent such complications, DJ stents are placed prophylactically during ureteral anastomosis. However, the use of DJ stents after transplantation leads to an increase in UTI and haematuria (16). Alangaden et al (2006) reported that 71% of patients with stents and 33% of patients without stents developed a urinary tract infection (12). In this study, the length of stay of the DJ catheter in the patients was found to be  $44.22 \pm 26.46$  days. The results support the results of our study.

#### Limitations of the study

The main limitation of the study is that it was conducted in a single centre. This study does not reflect the general situation of kidney transplant patients in Turkey, and the results are limited to patients who underwent transplantation in only one organ transplant centre.

#### CONCLUSION AND RECOMMENDATIONS

Among the patients in our study, age, gender, chronic diseases, DJ catheter duration, dialysis duration, hospitalisation duration and number of immunosuppressive drugs used are among the risk factors for the development of UTI after KTx. Nurses are responsible for the timely and effective prevention and control of UTI in patients in the early stages after kidney transplantation. The results of this study can be a reference to improve the quality of nursing care after KTx and promote the rehabilitation of kidney transplant patients, and can also be effective in creating evidence-based nursing care.

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### **CRedit authorship contribution statement**

**Dilek Soylu:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft. **Ayşe Soylu:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing, Investigation, Project administration, Software, Supervision, Validation, Writing – review & editing.

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