

Incidence, Risk Factors and Consequences of Urinary Tract Infection following Renal Transplantation

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ABSTRACT

Background: Urinary tract infection (UTI) is a common complication after renal transplantation. Our aim is to evaluate the incidence, risk factors and outcomes of UTI and describe the resistance pattern among causative organisms.

Methods: We conducted a retrospective cohort study of all patients who underwent renal transplantation between January, 2012 and June, 2015 at King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia. Baseline characteristics, clinical and microbiological data were collected.

Results: Of the 283 patients followed for one year post renal transplantation, 243 patients received kidneys from living related donors and 40 patients received from deceased donors. The mean age of our cohort was 39 years (Standard Deviation-SD 14.7). During one year of follow up, a total of 101 episodes of UTI were observed in 53 patients. The mean time to first UTI episode was 3 months (SD 3.5). High frequency of pyelonephritis were observed compared to cystitis. Fourteen patients had more than one episode of UTI during the first year post transplantation. Most common organisms were *Klebsiella pneumoniae* (47.7%) followed by *E coli* (28%) and *pseudomonas* (9.3%). Extended spectrum beta lactamase (ESBL) producing enterobacteriaceae were detected in 43% UTI episodes whereas carbapenem-resistant enterobacteriaceae were detected in 7 episodes (6.5%). In univariate analysis, age (OR 1.02, 95% CI: 1.00-1.04, P=0.045), female gender (OR 3.93, 95% CI: 2.11-7.33, P<0.001) and UTI within 3 months prior to transplant (OR 4.54, 95% CI: 1.60-17.77, P=0.03) were associated with the development of UTI post-transplant. In the multivariable model, female gender OR 8.54 (95% CI (3.57-20.46) P<0.001) and UTI within 3 months prior transplant OR 6.06 (95% CI (1.14-32.33) P<0.035) were independent risk factors for the development of UTI. No Mortalities were observed in our cohort during one year follow up.

Conclusions: Female gender and history of UTI within 3 months prior to transplant were associated with UTI post-transplant. In our cohort, UTI caused by ESBL and carbapenemase producing enterobacteriaceae were substantially higher as compared to previous studies.

BACKGROUND

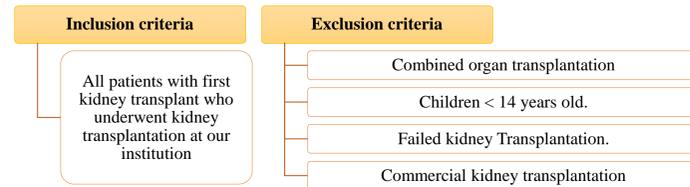
- Concomitant with the rise in end stage renal disease burden witnessed in the Kingdom of Saudi Arabia over the last decades, rapid advances have been implemented in the field of renal replacement therapy in attempts to improve survival rate and overall quality of life among affected patients.
- Major barriers to successful renal transplantation, such as infectious complications, are of concern to overall allograft survival.
- urinary tract infections (UTIs) that account for 40-50% among all nosocomial infections in post-transplant patients.
- Sixty percent of UTIs tend to occur during the first year post-transplant.
- There are several species of bacteria that cause UTI and which have been isolated in kidney transplant patients. The most frequently isolated bacterial pathogens includes gram-negative rods, such as *E coli* and other gram-positive bacteria such as *Enterococcus* species and *Staphylococcus aureus*.
- UTI occurs more frequently in post-transplant patients as compared to the general population.
- Post-transplantation UTI remains a major cause of morbidity and mortality in renal transplant recipients.
- Some retrospective cohort studies have shown that UTI may be associated with graft loss or chronic rejection.
- The rate of antibiotic resistance is highly alarming and life-threatening infections are an emerging problem in our community, that needs to be addressed especially among renal transplants recipients.

OBJECTIVES

- To identify the incidence of UTI in post kidney transplant recipients
- To identify the microbiology and the clinical pattern of resistance at King Faisal Specialist Hospital and Research Center (KFSHRC)
- To evaluate the risk factors of UTI in our population
- To determine the impact of UTI on graft function

MATERIALS AND METHODS

This is a retrospective cohort study to evaluate post-renal transplant patients who received their allograft at KFSH-RC Jeddah region between January 2012 and June 2015 and to determine the incidence of UTI in the first year after transplantation .

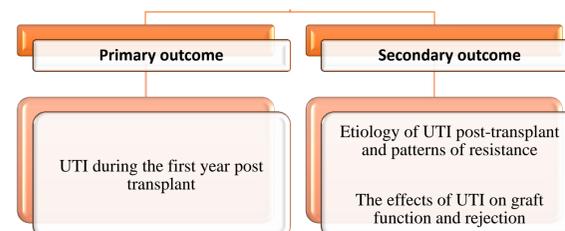


STUDY DEFINITIONS

- UTI 1)** Symptomatic UTI defined as: a positive urine culture (growth of $\geq 10^5$ bacterial cfu/ml) and the presence of one of the following symptoms: subjective fever or documented fever $> 38.0^\circ\text{C}$, dysuria, or urgency.
- 2)** Asymptomatic bacteriuria defined as: a positive urine culture (identified as $> 10^5$ colonies forming units (CFU) with no associated symptoms of UTI and no systemic clinical symptoms.
- Recurrent UTI:** was defined as having more than three episodes of UTI in one year.
- Pyuria:** Is defined as > 5 white blood cells per high power field in urinalysis.
- Delayed graft function:** Define as need for dialysis within the first week following transplantation.
- Renal Graft dysfunction:** Elevation in serum creatinine from baseline after 2weeks of completion of antibiotic treatment of UTI.
- Renal graft rejection:** Confirmed on renal biopsy.

TRANSPLANT PROTOCOL

All kidney graft recipients had a Foley catheter inserted during transplant surgery that was removed within 6 days of transplantation. Prolonged use of Foley catheter was defined as the use of a Foley catheter beyond day 6 after transplantation or the use of intermittent self-catheterization post-transplantation. Induction immunosuppressive therapy consisted primarily of antithymocyte globulin and interleukin-2 receptor antibody and maintenance immunosuppression included a calcineurin inhibitor and mycophenolate mofetil with corticosteroids. All patients received a dose of preoperative antibiotics (cefazolin) prior to surgery. Post-transplant infection prophylaxis included valganciclovir for 3 to 6 months for cytomegalovirus prophylaxis, and prophylaxis for *Pneumocystis jiroveci* for 12 months with trimethoprim/sulfamethoxazole. Patients with a history of sulfa allergy received dapsone, pentamidine, or no prophylaxis.



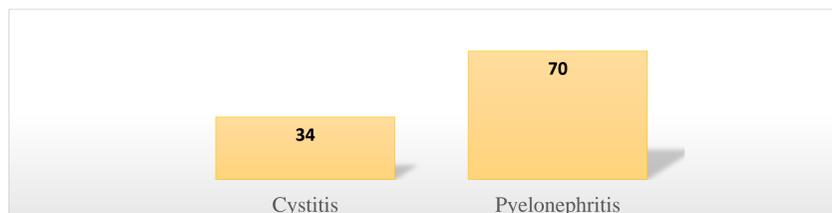
STATISTICAL ANALYSIS

Descriptive statistics using mean, median and IQR was used for quantitative variables; frequencies and percentages for categorical variables and chi square test or Fisher exact test were used to compare categorical variables. Univariate analysis was performed to identify risk factors associated with UTI post-transplant. A two sided alpha was set at 0.05.

RESULTS

Table 1. Patients demographics and baseline characteristics

Characteristic	Overall population (N= 283)	UTI	
		Yes N=53	No N=230
Age			
Mean \pm SD	39.1 \pm 14.7	38.3 \pm 14.2	42.8 \pm 16.4
Male [n(%)]	182 (64.3)	162 (70.4)	20 (37.7)
Female [n(%)]	101 (35.7)	68 (29.6)	33 (62.3)
BMI			
Mean \pm SD	24.76 \pm 5.6	24.7 \pm 5.5	25.1 \pm 6.0
Comorbidities [n(%)]			
Diabetes mellitus	68 (24.1)	53 (23.1)	15 (28.3)
HTN	232 (82.0)	192 (83.5)	40 (75.5)
CVD	52 (18.4)	40 (17.6)	12 (22.6)
CMV status (IgG)	270 (95.4)	221 (99.1)	49 (98.0)
Underlying renal disease [n(%)]			
Unknown	113 (39.9)	93 (40.8)	20 (37.7)
DM	41 (14.5)	31 (13.6)	10 (18.9)
HTN	33 (11.7)	28 (12.3)	5 (9.4)
Glomerular disease	65 (23.0)	50 (21.9)	15 (28.3)
Urological structure abnormalities	29 (10.2)	26 (11.4)	3 (5.7)
Type of donor [n(%)]			
Cadaveric	40 (14.1)	29 (12.6)	11 (20.8)
Living	243 (85.9)	201 (87.4)	42 (79.2)
Immunosuppression [n(%)]			
ATG	66 (23.3)	50 (21.7)	16 (30.2)
Basliximab	217 (76.7)	180 (78.3)	37 (69.8)
None	23 (8.1)	18 (8.3)	5 (10.2)
Mode of dialysis [n(%)]			
Hemodialysis	221 (78.1)	184 (84.8)	37 (75.5)
Peritoneal dialysis	22 (7.8)	15 (6.9)	7 (14.3)



RESULTS

Microbiology of UTI post renal transplant

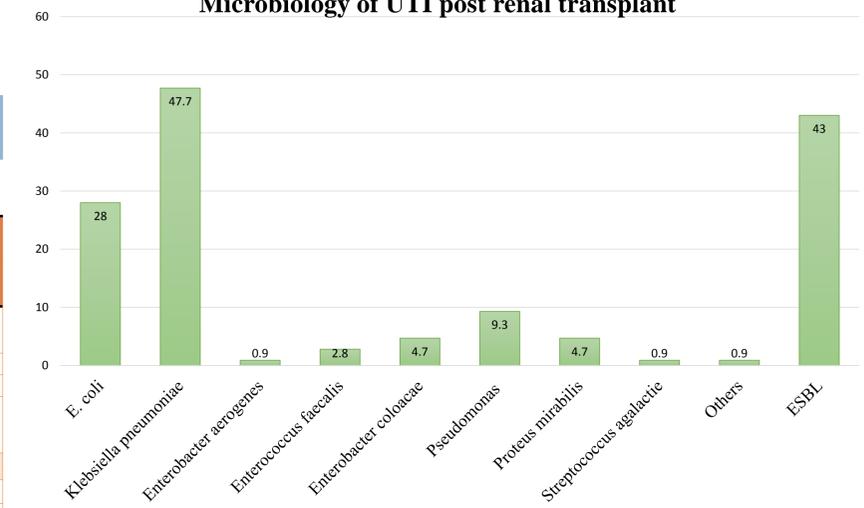


Table2. Univariate analysis for determinants of UTI in post-renal transplant patients

Factor	OR	95% CI	P value
Age	1.02	1.0-1.06	0.045*
Gender (Male=1, Female =2)	3.93	2.11-7.33	<0.001*
Allograft type (Living = 1, Deceased = 2)	1.82	0.84-3.92	0.129
Previous history of UTI	4.54	1.60-17.77	0.030*

Table3. Multivariable logistic regression result for determinants of UTI in post-renal transplant patients

Factor	OR	95% CI	P value
Age	1.03	1.0-1.06	0.056
Gender (Male=1, Female =2)	8.54	3.57-20.46	<0.001*
Previous history of UTI	6.06	1.14-32.33	0.035*

CONCLUSIONS

- Female gender and history of UTI within 3 months prior to transplant were associated with UTI post-transplant.
- UTI caused by ESBL and carbapenemase producing enterobacteriaceae were substantially higher compared to previous studies.