Original Article

Incidence and Causes of Early Hospital Readmissions after Living Donor Renal Transplant – A Single Centre Study

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ABSTRACT

Background: Kidney transplantation in spite of being the best modality for the treatment of ESRD remains a complex therapeutic option as it has its own set of problems due to associated morbidity especially in the first month after transplantation. **Aim:** The primary aim of this study was to find the incidence, causes, and factors responsible for early hospital readmissions (EHRs) and secondary aim was to find the effect of EHR on morbidity, mortality, and graft loss. **Patients and Methods:** A retrospective analysis of the records of the chronic kidney disease (CKD) patients who underwent living donor renal transplantation. 202 patients were included in the study. Inpatient records and charts were assessed for the medical status of the patients, cause of CKD, comorbidities, admissions 3 months prior to transplant, vintage dialysis, and modality of dialysis. **Results:** Sixty-one (30.2%) patients were readmitted to the hospital once or more within 30 days of discharge after renal transplantation. Thirty-four (55.7%) patients in the EHR group were admitted once or more in the 90 days prior to transplant as compared to 48 (34%) patients in the no readmission group. Thirty-four (55.7%) patients in the EHR group were hospitalised again within 1 year of EHR and 50 (35.5%) in the no EHR group got admitted within 1 year of discharge. **Conclusions:** Renal transplant recipients with hospital admissions 90 days before transplant and readmissions within 30 days of discharge after transplantation are at high risk of morbidity and should be treated as high-risk category and should have more stringent follow-up protocols.

KEYWORDS: *Early, living donor, readmissions*

INTRODUCTION

Kidney transplantation is considered the best treatment option for patients with end-stage renal disease (ESRD). However, it remains a complex treatment option as it may lead to morbidity and extra expenditure in the postoperative period due to early hospital readmissions (EHRs) defined as admission to any acute care hospital within 30 days of discharge. EHR after transplantation are usually due to factors unique to it and are not necessarily a measure of quality of medical care[1] EHR is also considered a risk factor for late hospital readmission (LHR), defined as admission within 1 year following EHR. Risk factors for early rehospitalization following kidney transplantation, including demographic, socioeconomic, donor factors, recipient factors, and factors related to transplant surgery have been studied.[2] Many previous studies have concluded that EHR is an independent risk factor for morbidity and graft loss in renal transplant recipients but very few studies have mentioned exact causes of the readmissions in their series.[3,4] EHR incidence and causes are directly related to the local characteristics of the population and healthcare system and it is important to know them in order to formulate strategies to reduce further morbidity in these patients.[5,6] Hence, the primary aim of this study is to find the incidence, causes, and

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factors responsible for early hospital readmissions and secondary aim is to find the effect of EHR on morbidity, mortality, and graft loss.

Patients and Methods

After receiving approval from the institutional ethics committee (IEC/2020/79/MA12) a retrospective analysis of the records of the chronic kidney disease (CKD) patients who underwent living donor renal transplantation from October 2012 to March 2020 was done. Only adult patients who underwent living donor renal transplantation were included, while patients with previous history of renal transplantation were excluded. Patients lost to follow-up were excluded from the study. 216 patients underwent living donor renal transplantation during the study period, 10 pediatric transplants were excluded from the study, one patient who was lost to follow-up after discharge was excluded from the study, one patient with previous renal transplant was also excluded from the study, two patients who underwent re-anastomosis intra operatively and had prolonged cold ischemia time were also excluded from the study. 202 patients were included in the study. The patients were divided into two groups: readmission and no readmission within 30 days. Inpatient records and charts were assessed for the medical status of the patients, cause of CKD, comorbidities, admissions 3 months prior to transplant, vintage dialysis, modality of dialysis. Data collected was age, gender, height, weight, body mass index, hepatitis C status, donor age, immunosuppression used, induction used, hospital stay, postoperative complications and secondary procedures, number, duration and causes of readmissions post transplantation, evaluation, and management done during readmissions.

Data was represented as mean and or frequencies. Chi-square test was applied to see the Fisher's exact association between categorical data and Student's t-test/ Mann–Whitney test as appropriate for the continuous data. Univariate and multivariate logistic regression was applied to find out the risk factors. *P* value of less than 0.05 was considered significant [Table 1].

Results

Mean age of the patients was 36.35 ± 10.85 years. 167 (82.7%) patients were male and 35 (17.3%) were females. Mean BMI of the patients was 21.72 ± 3.31. 155 (76.7%) patients were hypertensive at the time of transplant. There was no significant difference in incidence of early readmissions in hypertensive and

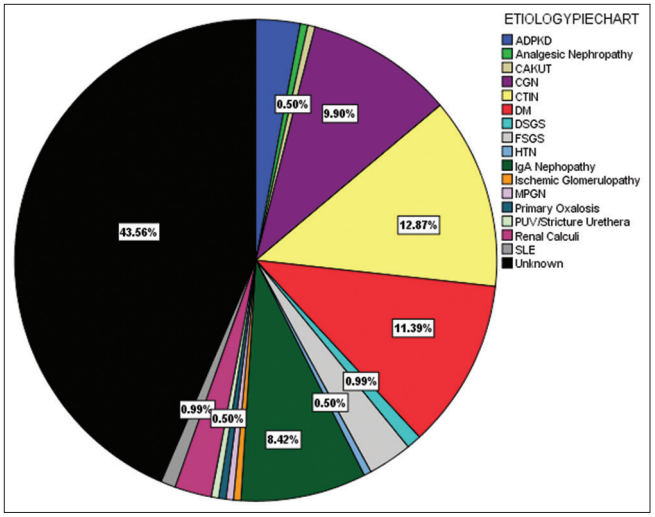

Chart 1: Etiology of chronic kidney disease. ADPKD: Adult polycystic kidney disease, CAKUT: Congenital anomalies of kidney and urinary tract, CGN: Chronic glomerulonephritis, CTIN: Chronic tubulointerstitial nephritis, DM: Diabetes mellitus, DSGS: Diffuse segmental glomerulosclerosis, FSGS: Focal segmental glomerulosclerosis. HTN: Hypertension, MPGN: Membranoproliferative glomerulonephritis, PUV: Posterior urethral valve, SLE: Systemic lupus erythematosis

Table 1: Recipient, donor, and transplant characteristics and outcomes

Characteristics	Total Patients (*n*=202)	EHR group (*n*=61)	No EHR group (*n*=141)	*P*
Age of recipient, (mean±SD), (years)	36.35±10.85	36.66±10.68	36.22±10.95	0.794
Males *n* (%)	167 (82.7)	54 (88.5%)	113	0.148
Body mass index (mean±SD), (kg/m^2)	21.72±3.31	21.65±3.44	21.75±3.26	0.849
Hypertension *n* (%)	155 (76.7%)	49 (80.3%)	106 (75.2%)	0.426
Other co morbidities *n* (%)	84 (41.6%)	26 (42.6%)	58 (41.1%)	0.844
HCV Antibody positive *n* (%)	14 (6.9%)	5 (8.2%)	9 (6.4%)	0.764
Dialysis vintage, (mean±SD) (months)	9.38±8.81	8.34±7.24	9.83±9.40	0.272
Donor age (mean±SD), (years)	45.23±10.40	43.46±10.47	45.99±10.37	0.112
Hospital stay for transplant (mean±SD), (days)	12.56±5.45	11.97±3.54	12.82±6.14	0.315
Use of induction therapy *n* (%)	116 (57.4%)	36 (59%)	80 (56.7%)	0.764
Admission 90 days before transplant *n* (%)	82 (40.6%)	34 (55.7%)	48 (34%)	0.044
Late hospital readmission *n* (%)	84 (41.6%)	34 (55.7%)	50 (35.5%)	0.007
Graft failure within 1 year *n* (%)	6 (3%)	4 (6.6%)	2 (1.4%)	0.069
Mortality within 1 year *n* (%)	1 (0.5%)	1 (1.63%)	0	

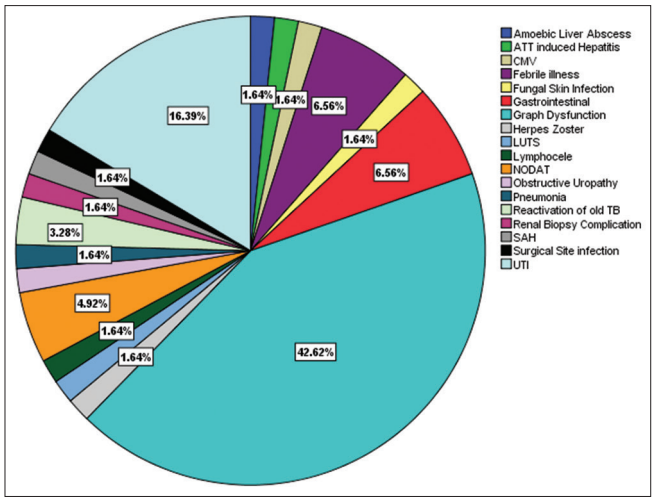

Chart 2: Causes of early hospital readmission. ATT: Antitubercular treatment, CMV: Cytomegalovirus, LUTS: Lower urinary tract symptoms, NODAT: New onset diabetes after transplantation, SAH: Subarachnoid haemorrhage, UTI: Urinary tract infection

non-hypertensive recipients. 84 (41.6%) patients had one or more comorbidities other than hypertension. 26 (42.6%) patients with one or more comorbidity were readmitted within 30 days of discharge and 58 (31%) patients without any comorbidity had one or more EHR and the difference was not statistically significant. 45 (22.3%) patients were tubercular. 24 (11.9%) patients were hypothyroid. In 88 (43.6%) of patients cause of CKD was not established. Diabetes mellitus was the cause in 23 (11.4%) and IgA nephropathy in 17 (8.4%) patients (pie Chart 1). 14 (6.9%) patients were hepatitis C positive. Donor was wife in 56 (27.7%) cases, husband in 5 (2.5%) cases, first degree relatives in 132 (65.3%) cases and second-degree relatives in 9 (4.5%) cases. Mean age of the donor was 45.23 ± 10.40 years. 13 (6.4%) patients underwent ABO incompatible renal transplant. Induction was used in 116 (57.4%) cases. 61 (30.2%) patients were readmitted to the hospital once or more within 30 days of discharge after renal transplantation. Mean duration between discharge and first readmission was 10.10 days. Mean duration of hospital stay during EHR was 6.15 in readmitted patients. 34 (55.7%) patients in the EHR group were admitted once or more in the 90 days prior to hospital and 48 (34%) patients in the no readmission group were admitted to the hospital 90 days before transplant and the difference was statistically significant (p-0.004). Patients who were admitted once or more 90 days before transplant were at significant risk of readmission within 30 days of discharge after transplantation. Most common cause of readmission within 30 days of discharge was graft dysfunction which lead to 26 (42.6%) readmissions (Pie Chart 2). Out of 26 patients admitted for graft dysfunction, 10 (38.46%) patients were found to have acute cellular rejection, 3 (11.26%) patients had acute humoral rejection and 2 (7.69%) patients were diagnosed to have calcineurin inhibitor toxicity and in 11 (42.30%) patients cause of graft dysfunction could not be ascertained. Urinary tract infection was the second most common cause for readmissions within 30 days which lead to 10 (16.39%) admissions. 34 (55.7%) patients in the EHR group were hospitalised again within 1 year of EHR and 50 (35.5%) in the no EHR group got admitted within 1 year of discharge after transplantation and the difference was statistically significant (p-0.007). Graft failure within 1 year occurred in 4 (6.6%) patients in EHR group and 2 (1.4%) patients in no EHR group, the difference was however not statistically significant (p-0.069). There was 1 (0.5%) mortality among recipients within 1 year of transplant.

Discussion

Incidence of EHR in our series was 30.2% which is comparable to most previous studies. The most common cause of EHR in our series was graft dysfunction which leads to 26 (42.6%) admissions. A multicentre cohort study by Naylor *et al*.[6] also reported graft failure and rejection as the most common cause of HER. Some other studies have reported surgical complications as the commonest cause of EHR.[7,8] Urinary tract infections (UTI) was the second most common cause of EHR in our series which lead to 10 (16.39%) admissions and E coli (50%) was the most common causative organism. A study by Lubetzky *et al*.[9] reported that out of 462 recipients, 145 (31.4%) were readmitted within 30 days of discharge and the primary reason for readmission was surgery-site specific in 30 cases (20.7%). The same study reported that out of 115 recipients with nonsurgical causes of EHR 25 (21.7%) were due to infection, 24 (20.9%) graft dysfunction, 25 (21.7%) gastrointestinal, 25 (21.7%) metabolic, and 16 (13.9%) other reasons.[9] Another study by Harhay *et al*.[10] reported the causes of EHR as surgical complications (15%), rejection (14%), volume shifts (11%) and systemic and surgical wound infections (11% and 2.5%). Surgical cause for EHR in our series was 6.4%. Among surgical causes 1 (1.6%) patient was admitted for the management of lymphocele, 1 (1.6%) patient was admitted with ureteral obstruction, 1 (1.6%) was admitted management of severe lower urinary tract symptoms and 1 (1.6%) patient was admitted for surgical site infection. The reason for fewer surgical complications in our series may be relatively young recipients (average age 36.35 years) with low BMI (average 21.72) and also our series consisted

of only live donor renal transplantation which is a planned procedure in optimised patients.

A study about young and old recipients by Haugen *et al*.[11] reported that older recipients were at higher risk of EHR. Mc-Adams Demarco *et al*.[12] reported that among recipient factors, older age, female gender, diabetes and those with one or more comorbidity were independently associated with EHR. In our study we did not find the association of EHR with age as most of our recipients were young, there was no significant difference in EHR among males and females. There was no significant difference in EHR in diabetic recipients. Those with one or more comorbidities were also not at higher risk of EHR in our series. McAdams-Demarco *et al*.[12] also reported that patients with pre-emptive transplant, those on peritoneal dialysis and recipients with shorter duration of maintenance haemodialysis were on lesser risk of EHR. In our study only 2 patients had pre-emptive transplant and 2 patients were on peritoneal dialysis. Duration of dialysis was not a significant risk factor for EHR in our series. According to the available data we studied admissions of the recipients up to 90 days before transplant and we found a statistically significant relationship between admission 90 days before transplant and EHR (p value-0.004). Few studies have concluded that older donor is a risk factor for EHR whereas other studies did not find donor age to be a significant risk factor, our study also did not find any significant correlation between donor age and EHR.[13] A study by Dunn *et al*.[14] reported that expanded criteria deceased donor is an independent risk factor. Recipients in HLA incompatible renal transplants and those with higher HLA mismatch have been found to be at higher risk in other studies.[15] In our study 13 (6.4%) patients underwent incompatible renal transplant and they were not found to be at higher risk of EHR. Use of induction therapy has been found to reduce the risk of EHR in previous studies but our study did not find any significant difference in early readmission rates in the patients with use of induction therapy. Various previous studies have reported statistically significant relation of EHR and increased morbidity, graft loss, and mortality.[2] Our study also found statistically significant relationship between EHR and late hospital readmissions (p-0.007). Graft failure within 1 year was also higher in EHR group than those without EHR. 4 (6.6%) patients in the readmission group had graft failure within 1 year whereas 2 (1.4%) patients in the no early readmission group had graft failure in 1 year but the difference was not statistically significant (p – 0.069). Over-all there was 1 mortality within 1 year of transplant in our series.

Few previous studies have also noted that various patient and discharge level factors can also be responsible for high incidence of EHR in some patients like a study by Covert *et al*.[16] noted that lack of knowledge about post-transplant medications could be a factor in few patients. Similarly another study by Lubetzky *et al*.[9] noted that electrolyte abnormalities on the day of discharge was an independent risk factor for early readmission. Investigators in the previous studies have stressed upon the need for development of predictive models to guide the intervention strategies to reduce incidence of EHR.[17] Hogan *et al*.[18] suggested that more granular data collection about timing and type of readmission could be helpful in preparing more accurate predictive models which can then help in stratification of patients who are at high risk and need closer observation both before and after discharge from the hospital. A study about preventability and prognosis in patients with EHR after kidney transplantation by Harhay *et al*.[10] noted that only minority of causes of EHR are potentially preventable. In a study about predictive performance of 30-day readmission risk model by Taber *et al*.[19] concluded that inclusion of dynamic clinical data in predictive models could be helpful in increasing the predictive value. All these strategies have been proposed to decrease the overall incidence of early readmissions after renal transplantation which may be helpful in reducing the morbidity and total costs of transplantation.[12,20]

Our study is unique in many ways. Whereas most previous studies are on deceased donor renal transplantation this is one of the few studies involving only living donor renal transplants. Our study has highlighted all aspects of early readmissions after renal transplantation.

Limitations

Our study did not take into account the recipient frailty status which may be an important direct risk factor for predisposition to EHR and overall morbidity.[21] Being a retrospective study, it may have missed many important clinical aspects related to predisposition for EHR. Prospective studies are required to look into the causes and factors leading to EHR to control them effectively.

Conclusion

Renal transplant recipients with hospital admissions 90 days before transplant and those with readmissions within 30 days of discharge after transplantation are high-risk groups and should have more stringent follow-up protocols to prevent further morbidity.

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Conflicts of interest

There are no conflicts of interest.

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