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One-year survival analysis and clinical outcomes of kidney transplant recipients; an observational cross-sectional study

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ABSTRACT

Introduction: Kidney transplantation is the treatment of choice for end-stage renal disease (ESRD), offering improved survival and quality of life compared to dialysis; however, postoperative complications and short-term outcomes remain important concerns.
Objectives: This study aimed to evaluate 1-year survival and clinical outcomes among kidney transplant recipients.
Materials and Methods: In this observational cross-sectional study, we reviewed the records of 101 adult patients with ESRD who underwent kidney transplantation at Shahid Sadoughi hospital between April 2015 and March 2019. Demographic and baseline clinical data, pre-transplant dialysis modality, donor source, and etiology of kidney failure were extracted from hospital and transplant clinic files, along with postoperative complications and episodes of virus infection during the first year after transplantation. One-year kidney transplantation–specific and overall survival were assessed using follow-up data and analyzed with Kaplan–Meier survival curves.
Results: This study included a total of 101 kidney transplant recipients with a mean age of 43.26 ± 14.28 years, most of whom had received grafts from deceased donors and undergone hemodialysis before transplantation. Postoperative complications were mainly infectious and pulmonary, although nearly half of the patients had an uncomplicated course, and opportunistic viral infections occurred in only a minority. The 1-year kidney transplantation–specific survival was 93.1%, and the mean survival time was 11.3 ± 0.25 (95% CI: 10.8-10.81). The 1-year overall survival was 89.1%, and the mean overall survival time was 11.47 ± 0.19 (95% CI: 11.09-11.84) months.
Conclusion: Kidney transplantation showed favorable 1-year outcomes with high graft-specific and overall survival rates, despite predominantly infectious and pulmonary complications, while many patients experienced an uncomplicated postoperative course.

Implication for health policy/practice/research/medical education:
This study indicated that postoperative kidney transplantation complications were mainly infectious and pulmonary, although nearly half of the patients had an uncomplicated postoperative course, and opportunistic viral infections were infrequent. The 1-year transplantation-specific survival rate was 93.1%, while the 1-year overall survival rate was 89.1%.
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Introduction

Chronic kidney disease (CKD) is a major global public health problem and may progress to end-stage renal disease (ESRD), a life-threatening condition that requires kidney replacement therapy by dialysis or transplantation (1-3). A systematic review and meta-analysis estimated the global prevalence of CKD at 13.4%, with stages 3–5 affecting approximately 10.6% of the population (1). ESRD is associated with high morbidity, reduced quality of life, cardiovascular complications, and substantial healthcare costs (4,5). Worldwide access to kidney replacement therapy remains unequal, and many patients requiring dialysis or transplantation may die prematurely because treatment is unavailable or inaccessible (4).

Kidney transplantation is considered the preferred treatment for suitable patients with ESRD because it provides better survival and quality of life than long-term dialysis (6,7). A systematic review including more than 1.9

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million participants reported that most studies showed significantly lower mortality among kidney transplant recipients compared with patients maintained on chronic dialysis (6). Wolfe et al demonstrated that although the early post-transplant period carries increased mortality risk, long-term mortality among kidney transplant recipients was 48–82% lower than among wait-listed dialysis patients (8). Therefore, transplantation is not only a renal replacement therapy but also a survival-improving intervention for appropriately selected patients with ESRD (8-10).

The first year after kidney transplantation is a critical period for evaluating patient survival, graft function, and early clinical complications (11,12). Ojo et al reported that patient survival among renal transplant recipients with functioning grafts was 97% at 1 year, 91% at 5 years, and 86% at 10 years (11). Early outcomes may be influenced by delayed graft function, acute rejection, infection, cardiovascular events, and baseline recipient comorbidities. Hariharan et al showed that serum creatinine levels at 6 months and 1 year after transplantation strongly predicted long-term graft survival (13). Thus, assessing one-year survival and clinical outcomes provides important evidence for identifying early risk factors, improving post-transplant monitoring, and optimizing the long-term success of kidney transplantation

Objectives

The objective of this study was to evaluate the 1-year kidney transplantation–specific survival, overall patient survival, and early clinical outcomes, including postoperative complications and opportunistic viral infections, among kidney transplant recipients at Shahid Sadoughi hospital.

Materials and Methods

Study design and participants

This observational cross-sectional study was conducted at Shahid Sadoughi Hospital, a tertiary referral center for kidney transplantation, in Yazd, Iran. The study population included 101 adult patients who underwent kidney transplantation at this center between April 2015 and March 2019 and had at least 1 year of follow-up.

Inclusion criteria

- Adult patients with ESRD who underwent kidney transplantation at Shahid Sadoughi Hospital between April 2015 and March 2019.
- Recipients with available complete medical records for demographic, clinical, and postoperative data.
- Patients who had at least 12 months of follow-up after transplantation or documented death within the first post-transplant year.

Exclusion criteria

- Patients who underwent combined organ transplantation (e.g., kidney–pancreas).
- Recipients with incomplete or missing key clinical or follow-up data.
- Patients lost to follow-up before the end of the first post-transplant year, with no reliable information on survival or graft status.

Data collection

Data were collected retrospectively from the medical documents of kidney transplant recipients archived in Shahid Sadoughi Hospital. Demographic characteristics (age and gender), pre-transplant dialysis modality, donor source, blood group, and etiology of ESRD were extracted using a structured data collection form. Postoperative complications, as well as episodes of BK polyomavirus and cytomegalovirus infection, were recorded during the first post-transplant year. One-year kidney transplantation–specific and overall survival were assessed using follow-up data and analyzed with Kaplan–Meier survival curves.

Outcome measurement

The primary outcome measures were 1-year kidney transplantation–specific survival and 1-year overall patient survival. Kidney transplantation–specific survival was defined as survival of the graft without irreversible rejection, with deaths from causes unrelated to graft failure treated as censored events in the analysis. Overall survival was defined as survival of the recipient from the time of transplantation to death from any cause or last follow-up within the first post-transplant year. Secondary outcomes included the occurrence of postoperative complications and opportunistic viral infections during the same period.

Statistical analysis

Statistical analyses were performed using SPSS version 27 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation, and categorical variables as frequencies and percentages. One-year kidney transplantation–specific and overall survival were estimated using the Kaplan–Meier method, and survival time was reported with 95% confidence intervals (CIs).

Results

Among the 101 kidney transplant recipients with a mean age of 43.26 ± 14.28, almost an almost even distribution between men and women. Most patients had undergone hemodialysis before transplantation, while a smaller proportion had received peritoneal dialysis or no dialysis at all. The vast majority of grafts were obtained from deceased donors, with only a few comings from living donors. ABO blood groups were predominantly the common positive types, with negative and AB groups occurring infrequently. Hypertension and diabetes were the leading underlying causes of kidney failure, followed by autosomal dominant polycystic kidney disease, with autoimmune, reflux-related, stone-related, post-

infectious, and miscellaneous etiologies accounting for the remaining cases (Table 1).

Among the kidney transplant recipients, postoperative complications were relatively common, with infections such as urinary tract and surgical site infections, as well as pulmonary complications, representing the predominant adverse events. A smaller proportion of patients experienced neurological, thromboembolic, hematologic, or other less frequent complications, while nearly half of the cohort had an uneventful postoperative course without any recorded problems. Viral reactivation with BK polyomavirus and cytomegalovirus was documented in a minority of patients, reflecting the expected burden of opportunistic infections in this immunosuppressed population. Despite these challenges, kidney transplant–specific survival at one year remained high, and overall patient survival during the same period was also favorable, indicating that most recipients derived sustained benefit from transplantation over the first post-transplant year (Table 2).

In this Kaplan–Meier analysis, patients who died within the first year from causes other than kidney graft rejection were considered censored, and survival was evaluated as kidney transplantation–specific survival. The 1-year kidney transplantation–specific survival was 93.1% (n = 94), and the mean kidney transplantation–specific survival time was 11.3 ± 0.25 months, with a 95% CI of 10.8 to 11.81 months (Figure 1).

In the overall patient survival analysis, 11 patients died during the first year due to graft loss and/or other causes. The 1-year overall survival was 89.1% (n = 90), and the mean overall survival time was 11.47 ± 0.19 months, with a 95% CI of 11.09 to 11.84 months (Figure 2).

Table 1. Demographic and clinical profile of kidney transplant recipients

Demographic and clinical data		Frequency	Percent
Gender	Male	53	52.5
	Female	48	47.5
Pre-transplant dialysis modalities	Venous hemodialysis	81	80.2
	Peritoneal dialysis	17	16.8
	No history of dialysis	3	3
Source of transplanted donor kidneys	Deceased donors	96	95.04
	Living donors	5	4.95
Blood groups	A+	28	27.7
	B+	28	27.7
	AB+	3	3
	O+	33	32.6
	A-	3	3
	B-	4	4
	AB-	0	0
	O-	2	2
Etiology of kidney failure	Diabetes	29	28.7
	Hypertension	33	32.7
	SLE	4	4
	Nephrolithiasis	1	1
	Vesicoureteral reflux	2	2
	ADPKD	18	17.8
	PSGN	1	1
	Other causes	13	12.8
Age (year; Mean ± SD)		43.26 ± 14.28	

SLE: Systemic lupus erythematosus; ADPKD: Autosomal dominant polycystic kidney disease; PSGN: Post-streptococcal glomerulonephritis; SD: Standard deviation.

Discussion

The present study showed favorable one-year outcomes after kidney transplantation, with a transplantation-specific survival rate of 93.1% and an overall survival rate of 89.1%. These findings are consistent with previous evidence showing that kidney transplantation is associated with better clinically relevant outcomes than remaining on chronic dialysis in appropriately selected patients with ESRD (6). Contemporary registry-based studies have also reported excellent short-term outcomes after kidney transplantation, although direct comparison with the present study is limited by differences in study design, population characteristics, donor source, and definitions of survival outcomes (14). Ojo et al reported high one-year survival among renal transplant recipients with functioning grafts, supporting the concept that early post-transplant survival is generally favorable when graft function is maintained (11).

Postoperative complications in the present study were

Table 2. Frequency distribution of postoperative complications and outcomes following kidney transplantation in the included patients

Demographic and clinical data		Frequency	Percent
Postoperative complications	Cr raising	9	8.9
	SSI	12	11.9
	UTI	17	16.8
	Pulmonary complications	8	7.9
	Seizure	1	1
	DVT	1	1
	Anemia	1	1
	Other complications	2	2
	No complications	50	49.5
Infection with BKV	Yes	7	6.9
	No	94	93.1
Infection with CMV	Yes	13	12.9
	No	88	87.1
One-year kidney transplantation–specific survival	No	7	6.9
	Yes	94	93.1
One-year overall survival	No	11	10.9
	Yes	90	89.1

Cr: Creatinine; SSI: Surgical site infection; DVT: Deep vein thrombosis; UTI: Urinary tract infection; CMV: Cytomegalovirus; BKV: BK polyomavirus.

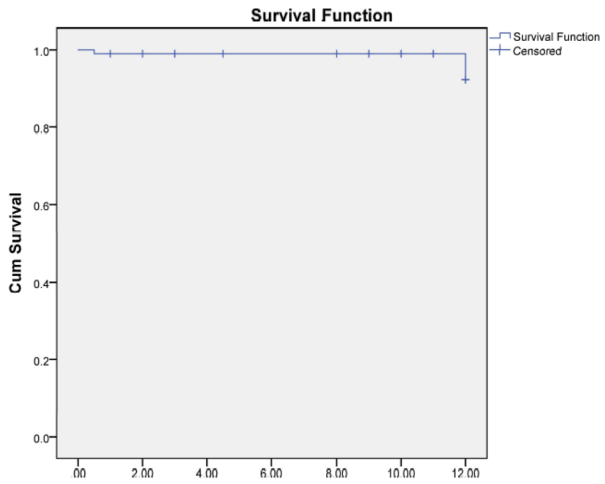

Figure 1. One-year transplantation-specific survival of kidney transplant recipients using the Kaplan–Meier analysis.

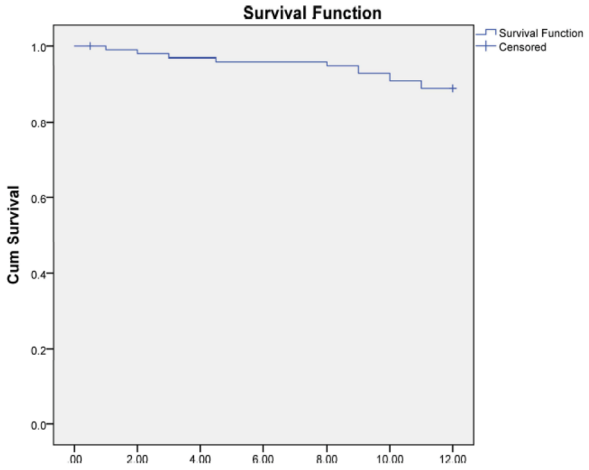

Figure 2. One-year overall survival of kidney transplant recipients using the Kaplan–Meier analysis.

mainly infectious and pulmonary, while nearly half of the patients had an uncomplicated postoperative course. This pattern is clinically consistent with previous literature showing that infections remain among the most important complications after kidney transplantation, particularly during the first year when immunosuppression is relatively intense (15). The pulmonary component of the complications is also consistent with previous transplant literature, as Kupeli et al reported that pulmonary infections were a primary pulmonary complication in renal transplant recipients during the first year after transplantation (16). However, because the present results do not provide organism-specific, severity-specific, or time-specific complication data, comparison with previous studies should remain descriptive rather than quantitative.

An important finding of the present study was that opportunistic viral infections were infrequent. This finding differs from some reports in which opportunistic infections, especially viral infections such as cytomegalovirus and BK virus, represented a major post-transplant concern (17). Nevertheless, this difference should not be overinterpreted because the present results do not provide details regarding viral screening protocols, prophylaxis, diagnostic thresholds, or immunosuppressive regimens. Therefore, the low frequency of opportunistic viral infections in this cohort should be interpreted as a descriptive local finding rather than evidence of a lower underlying risk.

The observed one-year survival rates should also be interpreted in the context of the known importance of early post-transplant clinical events. Schold et al showed that first-year clinical events, including infection, cardiovascular events, and rejection, are relevant to long-term kidney transplant outcomes (18). Similarly, Hariharan et al demonstrated that renal function during the first year after transplantation predicts long-term graft survival (13). The present study did not report renal function indices or detailed predictors of mortality or graft-related outcomes; therefore, it cannot determine which clinical factors contributed most strongly to survival. However, the coexistence of high one-year survival with a substantial proportion of uncomplicated postoperative courses suggests generally acceptable short-term clinical outcomes in this cohort.

Overall, this study supports that kidney transplantation was associated with favorable one-year transplantation-specific and overall survival, despite infectious and pulmonary postoperative complications. The findings highlight the continued importance of early postoperative surveillance, particularly for infection and pulmonary complications, while also showing that many recipients may experience an uncomplicated early course. Further studies with detailed complication classification, graft function measures, and longer follow-up would be useful to clarify predictors of survival and long-term graft outcome.

Conclusion

In conclusion, this study demonstrates favorable short-term outcomes following kidney transplantation, with high 1-year graft-specific and overall survival rates. Although postoperative complications were primarily infectious and pulmonary, a substantial proportion of patients experienced an uncomplicated recovery, and opportunistic viral infections remained relatively uncommon. These findings highlight the overall effectiveness and safety of kidney transplantation, while underscoring the importance of vigilant monitoring and management of infectious and pulmonary complications to improve patient outcomes further.

Limitations of the study

This study's single-center, observational, cross-sectional

design may limit the generalizability of the results to other transplant populations with different demographic or clinical characteristics. The reliance on retrospective chart review raises the possibility of incomplete documentation or misclassification of complications and causes of death. In addition, the relatively small sample size and restriction to a 1-year follow-up period may have reduced the power to detect less frequent adverse events and do not allow assessment of long-term graft and patient outcomes. Potential confounding factors, such as variations in immunosuppressive regimens, adherence, and comorbidities, were not fully controlled for and could have influenced the observed survival and complication rates.

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Authors' contribution

Conceptualization: Mahda Iliae and Ahmad Shajari.
Data curation: Hossein Aarafi and Mahda Iliae.
Formal analysis: Hossien Fallahzadeh.
Investigation: Mahda Iliae and Hossein Aarafi.
Methodology: Hossein Aarafi and Hossien Fallahzadeh
Project management: Ahmad Shajari.
Resources: All authors.
Supervision: All authors.
Validation: Ahmad Shajari.
Writing–original draft: All authors.
Writing–review and editing: All authors.

Conflicts of interest

The authors declare no conflict of interest.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration of generative artificial intelligence (AI) and AI-assisted technologies in the writing process

While preparing this work, the authors utilized AI (Grammarly and Perplexity) to refine grammar points and language style. Subsequently, they thoroughly reviewed and edited the content as necessary, assuming full responsibility for the publication's content.

Ethical issues

The research was conducted in accordance with the principles of the Declaration of Helsinki. This study was conducted at Shahid Sadoughi Transplant Center in Yazd. It was derived from the thesis work of Mahda Iliae (Thesis#160275), approved by the ethics committee of the Islamic Azad University - Isfahan, Iran (ethics approval code: IR.IAU.KHUISF.REC.1399.177; https://ethics.research.ac.ir/form/i6ja08qgx9l65wpf.pdf) registered on September 16, 2020. Besides, the authors have ultimately observed ethical issues (including plagiarism, data fabrication, and double publication).

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