

*Original Research Article*

## Investigating the Relationship between Diabetes and Consequences of Kidney Transplantation

Farshid Haghi<sup>1\*</sup>, Somayeh Ebrahimi<sup>2</sup>, Mirwais Afzali<sup>1</sup>, Hadi Mohammadi Bidhendi<sup>3</sup>

<sup>1</sup>Student at Dalian Medical University, Dalian, Liaoning, China

<sup>2</sup>Student at Huazhong University of Science and Technology (HUST), Wuhan, China

<sup>3</sup>Bachelor of Dental Surgery student at Dalian Medical University, Dalian, China

### ARTICLE INFO

#### Article history

Submitted: 2022-12-02

Revised: 2023-01-26

Accepted: 2023-02-13

Available online: 2023-02-20

Manuscript ID: AJCB-2301-1149

DOI: 10.22034/ajcb.2023.379420.1149

#### KEYWORDS

Kidney Transplantation

Diabetes

Diabetes After Kidney Transplant

### ABSTRACT

This article compares the effects of pre- and post-transplant diabetes on the complications and consequences of kidney transplantation. This study was performed in Rasht city on patients who received a kidney transplant annually in 2019-2020. This study was performed by historical cohort method. Patients were divided into three groups that were compatible in terms of age, sex, and type of underlying renal disease. The first group consisted of patients who had diabetes before transplantation. The second group consisted of patients who did not have diabetes before transplantation but developed diabetes afterwards. The third group consisted of patients who did not have diabetes before or after transplantation. Record of all patients for one year in terms of function, delay and rejection of kidney transplantation, systemic infection, cancer, recurrence of underlying kidney disease, cardiovascular diseases, and their deaths are being investigated. The total number of patients participating in this study was 155 and their mean ages in the first, second, and third groups were 47, 47.1, and 47.3 years old, respectively. The incidence of the mentioned consequences and complications in each group 82.9, 57.1, and 97.1, respectively, was a percentage. After one year, the retention rate of transplanted kidney was 68.5, 77.1, and 47.1 was a percentage and the survival rate of patients was 82.8, 88.5, and 97.1 was a percentage, respectively. In this study, 21% of PTDM was obtained up to one year after kidney transplantation.

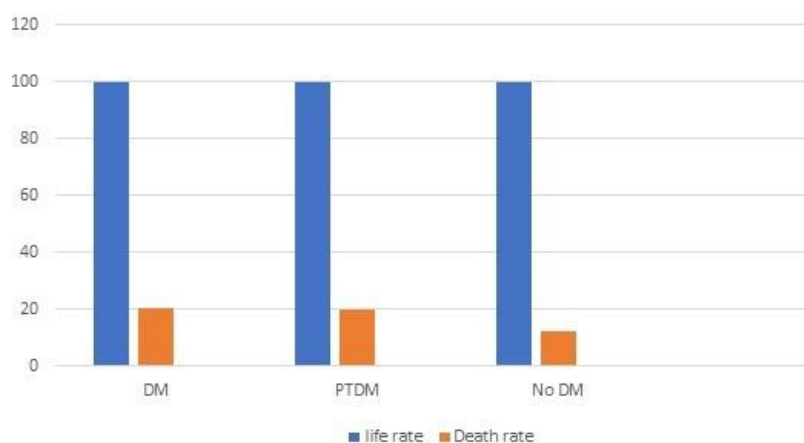
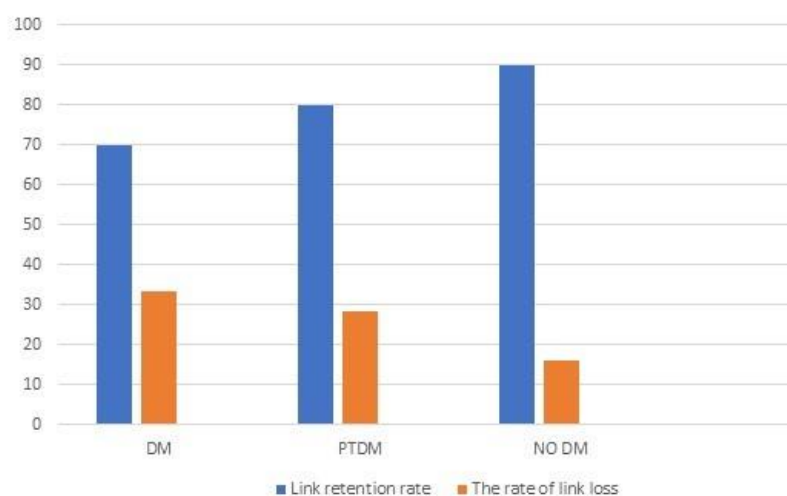
\* Corresponding author: Farshid Haghi

✉ E-mail: farshidh216@gmail.com

© 2023 by SPC (Sami Publishing Company)



---

**GRAPHICAL ABSTRACT**


### Introduction

The last stage of chronic kidney disease (CKD) is called end stage renal disease (ESRD), which often has a glomerular filtration rate (GFR) of less than 15 mL/min per 1.73 (mL/min/173 m<sup>2</sup>) or serum creatine more than 10 mg/dL. At this stage, alternative treatment is needed. There are three treatment options for these patients: hemodialysis (hD), peritoneal dialysis (pd), and kidney transplantation. The definitive treatment for kidney disease is lower cost, longer survival than dialysis, and increases the patient's quality

of life (1). Kidney transplantation has also complications that include transplant rejection and transplant-related death, which can be caused by cardiovascular disease, malignant infection, relapse, ground disease, and drug side effects (2). Diabetes is one of the risk factors for cardiovascular disease, death, and transplant loss (3). The diabetes incidence after kidney transplantation has similar complications, including cardiovascular disease, infection, especially urinary tract infection, pneumonia, and CMV infection (4). Decreased patient survival

and reduced transplant survival since primary diabetes and post-transplant diabetes have not been compared in terms of its effect on the incidence of kidney transplant complications in Iran (5,6). In this study, the rate of acute DGF rejection and death and one-year transplant stability in patients with type 1 diabetes (type 1 or 2) (7) and PTDM patients in transplant patients in Gilan province, Razi Hospital Rasht, during 2019 to 2020 who underwent kidney transplantation. We have examined their locations.

## 2. Methods

This study was performed by historical cohort method. First, the records of kidney transplant patients referred to Razi Hospital in Rasht between 2019 and 2020 who underwent kidney transplant surgery were reviewed. Our statistical population is 166 people, 155 of whom were alive at the time of this study, and all of them participated in this study with full satisfaction. 35 of them developed diabetes after PTDM after kidney transplantation according to Who criteria (8-9). Out of 73 patients who had diabetes (type 1 or 2) before kidney transplantation, 35 were the first in terms of age and gender similar to the exposed group were considered as DM group. Likewise, out of 58 patients who did not have diabetes before and after transplantation, 35 people who were similar in age to the previous two groups were selected as no DM group. The drug regimens of all three groups were similar after transplantation (prednisolone, mycophenolate mofetil, and cyclosporine).

The record of each patient from the time of transplantation to one year after it in terms of consequences and complications DGF, rejection of kidney transplant, systemic infection, cancer, recurrence of underlying disease, cardiovascular diseases, and their deaths were evaluated.

Data was analyzed by SPSS (Version 16) statistical software. Chi-square and t-test were used and the significance level for statistical tests. In addition, we deducted the cases of transplant rejection and death within one year after transplantation from the number of patients in each group and calculated the one-year retention rate of the transplanted kidney. Furthermore, the one-year life expectancy of patients was calculated for each group separately.

## 3. Findings

The total number of patients was 105 52% male and 48% female. The mean age of the study groups was 47, 47.2, and 47.1 years old, respectively. The PTDM prevalence in kidney transplant patients in Rasht was 21% (35 out of 166). The frequency of patients based on complications and consequences of transplantation (DGF and LOSS), systemic infection, cancer, underlying diseases, cardiovascular disease, and death due to them for each group are presented in Tables 1 and 2.

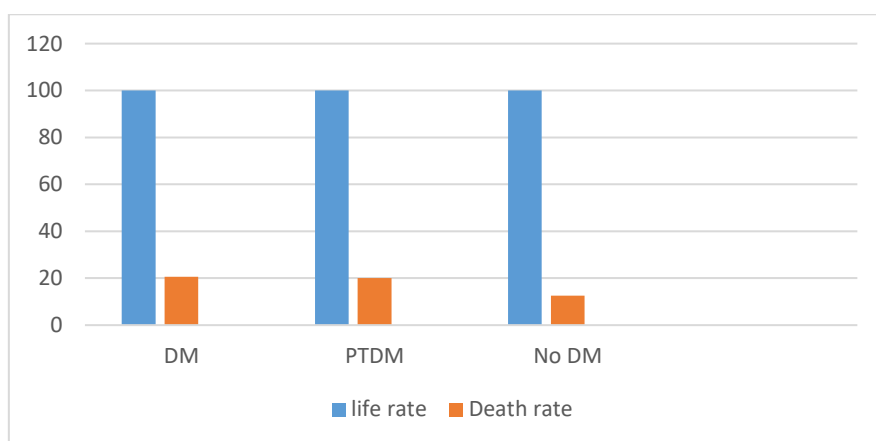
The mortality and survival rates of patients in three groups during one year after kidney transplantation are displayed in Figure 1. Moreover, the rate of transplantation and its loss in three groups one years after transplantation is depicted in Figure 2.

**Table 1.** Frequency distribution of patients by message in three study groups

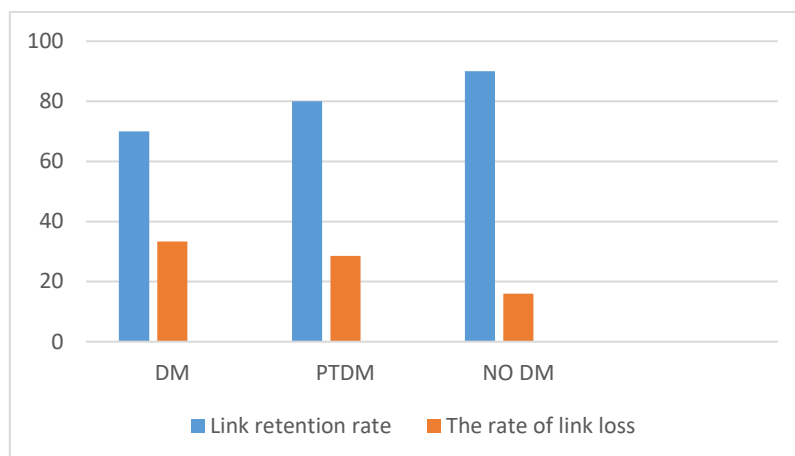
Group	DM	PTDM	NO DM
Have	29(82.9)	20(57.1)	8(22.9)
Don't have	6(17.1)	15(42.9)	27(77.1)
Total	35(100)	35(100)	35(100)
PV		0.0001	

**Table 2.** Distribution of death frequency by type of outcome in study groups

Demographic Factors	DGF	Rejection of kidney transplant	Systemic infection	cancer	Underlying disease	Cardiovascular disease	Total
Number of death DM percentage	0	1	2	1	0	2	6
Total cholesterol	%(0)	%(16.6)	%(28.5)	%(100)	%(0)	%(33.3)	%(20.6)
	6	6	7	1	3	6	29
Number of death PTDM percentage	1	1	1	0	0	1	4
Total cholesterol	%(33.3)	%(20)	%(20)	%(0)	%(0)	%(20)	%(20)
	3	5	5	0	2	5	20
Number of death No DM percentage	0	0	1	0	0	0	1
Total Cholesterol	%(0)	%(0)	%(33.3)	%(0)	%(0)	%(0)	%(12.5)
	2	2	3	1	0	0	8



**Figure 1.** Death and life expectancy of patients in three groups within one year after kidney transplantation



**Figure 2.** Transplant retention rate and its loss in three groups one years after kidney transplantation.

#### 4. Discussion

In this study, the PTDM method was 21% in 35 of 166 patients up to one year after transplantation. The findings of this study also showed that the incidence of complications and death transplantation in patients who had diabetes before kidney transplantation was higher than patients who developed diabetes after transplantation (19).

In the past, there were other indicators for determining PTDM. Furthermore, today, different drugs are used for transplantation, so it is not possible to compare the prevalence of PTDM in the articles of previous years with its current style. The PTDM prevalence in a 1979 study was estimated at 46%. A 2003 study in the United States found a prevalence of 9.1% after 12 months, 16% after 36 months, 24% was obtained (10).

##### **Risk complications for PTDM include:**

older age of the donor, older age of the transplant recipient, type of kidney type and immunosuppressive drugs especially tacrolimus, ancestral transplantation, some hla (B27\_3DR) hepatitis C virus infection, overweight, individual diet, individual with family history of diabetes, and type of underlying kidney disease polycystic (11).

Some factors reduce the PTDM rate, such as mycophenolate mofetil, azathioprine, young transplant recipient, glomerulonephritis as a cause of kidney failure, and knowledge (12).

The PTDM incidence has adverse effects on patient survival various studies have linked PTDM to high rates of cardiovascular disease and infection, and cited it as an important cause of death in transplant patients (21-23). However, none of these studies compared PTDM and the early diabetes in terms of complications. In this study, the incidence of adverse outcomes after transplantation in the group with diabetes was 82.9% and 57.1% in patients with PTDM.

In a study, patient survival after kidney transplantation was reported in patients with PTDM for 8.1 years and in non-diabetics for 11 years (13).

In another study, one-year survival of patients after transplantation was 83% in people with PTDM and 98% in people without PTDM (17-18).

In this study, the one-year life expectancy of patients with primary diabetes was 82.8%, in PTDM patients 88.5%, and in patients without diabetes 97.1%. PTDM still has an adverse effect on the survival of transplanted kidneys. In a 12-year transplant survival study in people with PTDM, 48% of people without it were 70% (14).

In the present study, the annual retention rate of transplanted kidneys in diabetic patients was

68.5% in the PTDF group 77.1% of non-diabetic patients was 91.4%. In the same study conducted in 1998, the risk of transplant rejection in PTDM was 3.75 times higher than non-diabetic transplant recipients, compared to 2.5 in the lead study and 2.5 times higher in diabetic patients than in non-diabetic patients. It was 3 times (15-16).

### Conclusion

Concerning the side effects that PTDM can have on patients and kidney transplantation, careful consideration in choosing a kidney donor, determining the dose and type of immunosuppressive drug, and regular follow-up of patients after transplantation are important for PTDM development. It is also noteworthy that patients who had diabetes before kidney transplantation will be more prone to complications than people who develop diabetes after transplantation, so it requires more careful care.

### References

- [1] G.M. Danovitch. Hand book of kidney transplantation. 4 ed. Philadelphia: Lippincott Williams & Wilkins, 2005.
- [2] H.E. Joist, D.C. Brennan. Post-transplant diabetes mellitus in renal transplant recipients. 2006.
- [3] R. Gunnarsson, P. Amer, G. Lundgren, G. Magnusson, J. Ostman, C.G. Groth. Diabetes mellitus-a more-common-than-believed complication of renal transplantation. *Transplant Proc.*, 11(2) (1979) 1280-1.
- [4] B.L. Kasiske, J.J. Snyder, D. Gilbertson, Matas Al. Diabetes mellitus after kidney transplantation in the United States. *Am J Transplant.*, 3(2) (2003) 178-85
- [5] F.G. Cosio, T.E. Pesavento, K. Osei, M.L. Henry, R.M. Ferguson. Post-transplant diabetes mellitus: increasing incidence in renal allograft recipients transplanted in recent years. *Kidney Int*, 59(2) (2001) 732-7.
- [6] M.I. Mabudian, J. Thomson, P. Kamar. Immunological and non-immunologic association post transplant diabetes mellitus (PTDM). *J Allerg Clin Immun.*, 113 (2Suppl) 1216-9.
- [7] E. Rodrigo, G. Fernández-Fresnedo, R. Valero, J.C. Ruiz, C. Piñera, R. Palomar, et al. New onset diabetes after kidney transplantation: risk factors. *J Am Soc Nephrol.*, 17(12 Suppl3) (2006) S291-5.
- [8] F.G. Cosio, L.J. Hickson, M.D. Gritfin, M.D. Stegall, Y. Kudva. Patient survival and cardiovascular risk after kidney transplantation the challenge of diabetes. *Am J Transplant*, 8(3) (2008) 593-9.
- [9] G. Fernández-Fresnedo, R. Escallada, AL de Francisco, E. Rodrigo, JA Zubimendi, JC Ruiz, et al. Post transplant diabetes is a cardiovascular risk factor in renal transplant patients. *Transplant Proc*, 35(2) (2003) 700-6.
- [10] D. Ducloux, A. Kazory, J.M. Chalopin. Post transplant diabetes mellitus and atherosclerotic events in renal transplant recipients. A prospective study. *Transplantation.*, 79(4) (2005) 438-43.
- [11] K. Lentine, D. Brennan, M. Schnitzler. Incidence and prediction of myocardial infarction after kidney transplantation. *J Am Soc Nephrol.*, 16(2) (2005) 496-506.
- [12] E.A. Friedman, T.P. Shyh, M.M. Beyer, T. Manis, K.M. Butt. Post transplant diabetes in kidney transplant recipients, *Am J Nephrol.*, 5(3) (1985) 196-202.
- [13] J.P. Boudreaux, L. McHugh, D.M. Canafax, N. Ascher, D.E. Sutherland, W. Payne, et al. The impact of cyclosporine and combination immunosuppression on the incidence of post-transplant diabetes in renal allograft recipients. *Transplantation.*, 44 (3) (1987) 376-81.
- [14] A.M. Miles, N. Sumrani, R. Horowitz, P. Homel, V. Maursky, M.S. Markell, et al. Diabetes mellitus after renal transplantation: as deleterious as non-transplant-associated

- diabetes?? *Transplantation*, 65(3)(1998) 380-4.
- [15] L. Vesco, M. Busson, J. Bedrossian, M.O. Bitker, C. Hiesse, P. Lang. Diabetes mellitus after renal transplantation: characteristics, outcome and risk factors. *Transplantation*, 61(10) (1996)1475-8.
- [16] V.K. Revanur, A.G. Jardine, D.B. Kingsmore, B.C. Jaques, D.H. Hamilton, R.M. Jmdal. Influence of diabetes mellitus on patient and graft survival in recipients of kidney transplantatim. *Clin Transplant.*, 15(2) (2001) 89. 94
- [17] R.M. Jindal, Hjelmesaeth. Impact and management of post transplant diabetes mellitus. *Transplantation*, 70(11 Suppl) (2000) S58-63.
- [18] F.G. Cosio, Y. Kudva, M. van der Velde, T.S. Larson, S.C. Textor, M.D. Giniffin, et al. New onset hyperglycemia and diabetes are associated with increased cardiovascular risk after kidney transplantution. *Kidney Int*, 67(6) (2005) 2415-21.
- [19] F.G. Cosio, T.E. Pesavento, S. Kim, K. Osei, M. Henry, R.M. Ferguson. Patient survival after renal transplantation IV Impact of post transplant diabetes *Kidney Int*, 62(4) (2002) 1440-6
- [20] R.D. Bloom. Crutchlow MF New-onset diabetes mellitus in the kidney recipient diagnosis and management strategies. *Clin J Am Soc Nephrol.*, 3 Suppl 2 (2008) S 38-48
- [21] J.T. Mathew, M. Rao, V. Job, S. Ratnaswamy, C.K. Jacob. Post transplant hyperglycemia: a study of risk factors. *Nephrol Diat Transplant*, 18(1) (2003) 164-71.
- [22] A. Samimi, B. Almasinia, E. Nazem, R. Rezaei, A. Hedayati, M. Afkhami, Investigating MIDEA Corrosion Treatment on Carbonic Simple Steel in Amin Unit of Isfahan Refinery, *International Journal of science and investigations*, 1 (2012) 49-53
- [23] M. Samimi, A. Samimi, Explosion of Resources Management in Iran, *International Journal of Innovation and Applied Studies*, 1 (2012) 232-235

#### HOW TO CITE THIS ARTICLE

Farshid Haghi, Somayeh Ebrahimi, Mirwais Afzali, Hadi Mohammadi Bidhendi. Investigating the Relationship between Diabetes and Consequences of Kidney Transplantation, Ad. J. Chem. B, 5 (2023) 108-114.

DOI: 10.22034/ajcb.2023.379420.1149

URL: [http://www.ajchem-b.com/article\\_167135.html](http://www.ajchem-b.com/article_167135.html)

