

Current Status of Kidney Replacement Therapy in Türkiye: A Summary of 2023 Turkish Society of Nephrology Registry Report

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ABSTRACT

Background: Turkish Society of Nephrology registry collects data on hemodialysis, peritoneal dialysis (PD), and transplantation annually. Registry reports are printed every year as a booklet, and this is the 34th year of the registry reports. The registry is in close collaboration with international registries.

Methods: In this paper, we summarized data from the 2023 registry report and provided yearly trends for managing end-stage kidney disease.

Results: The number of patients on kidney replacement therapy (KRT) increased; at the end of 2023, 89 527 patients were on KRT. The prevalence and incidence of end-stage kidney disease were 1048.7 and 159.8 per million population, respectively. Diabetes was the most common cause of end-stage kidney disease. Hemodialysis (70.88%) was the most common type of treatment modality, followed by transplantation (25.01%) and PD (4.11%).

Conclusion: End-stage kidney disease is a critical and growing health problem for our country. The kidney registry of the Turkish Society of Nephrology is one of the leading tools for providing current and sound data on this public health problem.

Keywords: Kidney failure, kidney replacement therapy, hemodialysis, peritoneal dialysis, kidney transplantation, registry

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INTRODUCTION

Turkish Society of Nephrology's renal registry (Turkish renal registry) was founded in 1990 by Prof. Dr. Ekrem Ereke, and this is its 34th anniversary. Initially, center-based data were collected through paper forms until 2007, after which the system transitioned to electronic data collection via the Internet. The registry gathers annual data on kidney replacement therapies (KRT), encompassing hemodialysis (HD), peritoneal dialysis (PD), and transplantation. Information from the Turkish Renal Registry is shared with the United States Renal Data System and the European Renal Association

registry, facilitating the comparison of KRT outcomes in Türkiye with global data. This year, patient data were obtained from a total of 225 KRT centers, covering 27% of HD patients, 52% of PD patients, and 33% of transplant patients in our country.

MATERIAL AND METHODS

This manuscript provides a summary of the 2023 registry report.¹ More comprehensive and detailed data can be found in the booklet "Registry of the Nephrology, Dialysis, and Transplantation in Türkiye, Registry 2023" published by the Turkish Society of Nephrology. Current



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and previous reports can be accessed from the website of Turkish Society of Nephrology (www.tsn.org.tr or www.nefroloji.org.tr).

Data were collected from selected KRT centers; moreover, a database under the health ministry supervision was used to obtain complete data. This approach has been used since the year 2012.

RESULTS

Incidence and Prevalence

At the end of the year 2023, there were a total of 89 527 patients who were on KRT. As in the previous year, the number of patients on KRT continued to increase in 2023. The most commonly used KRT method in prevalent patients was HD (70.88%), followed by transplantation (25.01%) and PD (4.11%). The incidence of KRT was calculated as 159.8 per million population (pmp) in 2023, and prevalence was calculated as 1048.7 pmp.

The annual incidence is higher in males (190.9 pmp) than in females (128.6 pmp), and it increases with age. The incidence of end-stage kidney disease (ESKD) treated with HD or transplantation is significantly higher in males than in females, whereas the rates for PD show no difference between genders. The incidence of ESKD treated with HD gradually increases with age. For PD, this increase is less pronounced. The incidence of ESKD treated with transplantation is highest in the young and middle-aged groups.

The rate of diabetic patients is 33.9% among incident patients. The diabetes rate is slightly lower than last year's rate. The diabetic patient ratio was similar in HD and PD patients (34.9% and 35.3%, respectively) and lower in patients with pre-emptive kidney transplantation (12.5%). Yearly changes in incidence and prevalence are shown in Figures 1 and 2. A stable trend in the incidence of ESKD requiring KRT observed over the last 10 years

continued in 2023. It was noted that the prevalence of ESKD requiring KRT began to increase from 2022 onwards. Home HD treatment, which has become increasingly widespread in recent years, is largely implemented in private centers.

Hemodialysis

In 2023, the number of incident HD patients was 10 276, showing no significant difference compared to the previous year (10 340). The number of prevalent HD patients (63 454), including those on home HD, has increased compared to previous year (61 723). The number of patients undergoing home HD has risen to 1331 compared to 1257 last year; however, evaluating this increase with consideration of the overall trend may provide a more accurate perspective. The age distribution of in-center HD patients is shown in Table 1. It should be noted that 52.5% of the patients were over the age of 65. In incident patients, the most common cause of kidney failure was diabetes mellitus (34.14%), followed by hypertension (30.43%), glomerulonephritis (4.32%), polycystic kidney disease (3.99%), and other causes. Primary etiology is unknown in 10.68% of the patients. The frequency of diabetes has remained stable over the past few years (Figure 3). It is not possible to clarify whether the high rate of hypertension is primary or secondary due to underlying kidney disease. In 39.7% of new HD patients, dialysis was initiated under urgent conditions. This rate has slightly increased compared to the previous year (31.1%). However, no significant trend is evident.

The most common type of vascular access at the initiation of HD was tunneled catheters at 51.4%, followed by arteriovenous (AV) fistulae at 26.6%, non-tunneled catheters at 21.8%, and arteriovenous grafts at 0.18%. Longitudinal data regarding arteriovenous access is shown in Table 2. The AV fistula was the most common type of access in prevalent patients (70.03%); however, the increasing use of catheters should be noted. Among monitored patients, the usage rate of catheters

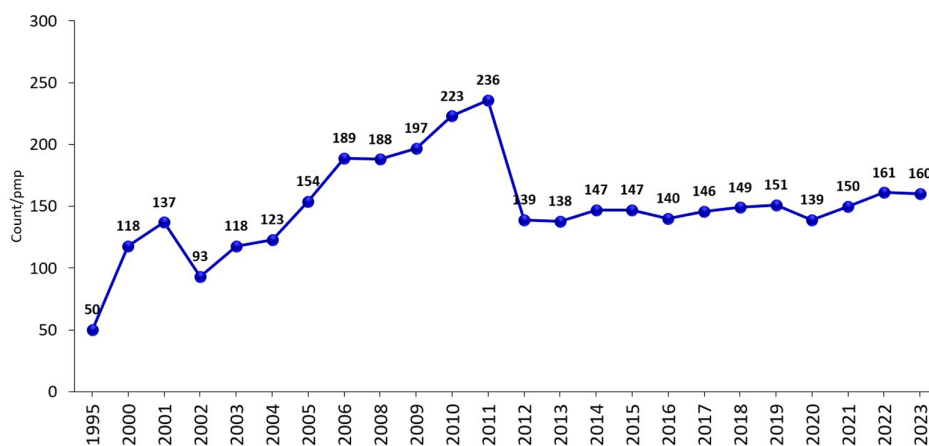


Figure 1. Incidence of patients on kidney replacement therapy by years. Since 2012, patient-based data provided by the Ministry of Health is used for the calculations.

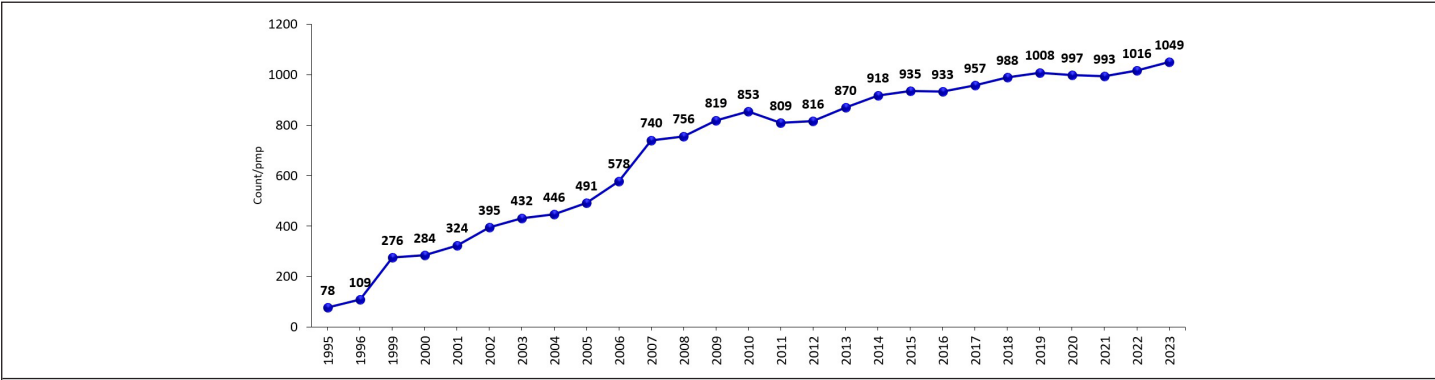


Figure 2. Prevalence of patients on kidney replacement therapy by years. Since 2012, patient-based data provided by the Ministry of Health is used for the calculations.

(tunneled or non-tunneled) is 29.23%. Unfortunately, a continued decline in fistula usage has been noted in recent years. The most common access site for non-tunneled catheter placement was the internal jugular vein (53.27%), followed by the femoral (22.45%) and subclavian (13.65%) vein.

Technical changes regarding HD treatment are shown in Table 2, high-flux membranes are usually used. The frequency of HD was 3 times/week in most of the patients (Table 2). Kt/V values are above 1.2 in 91.04% of in-center HD patients, indicating generally adequate dialysis dosing. This represents a notable increase compared to previous year (84.07%).

A blood pressure target of <140/90 mmHg was achieved in 75.6% of HD patients, regardless of whether they were receiving antihypertensive treatment. The most commonly used antihypertensive drug among HD patients was calcium channel blockers (24.27%). Yearly changes of various parameters regarding HD treatment are listed in Table 3. The frequency of hypoalbuminemia has decreased in previous years, with albumin levels remaining stable above 4.0 g/dL in a majority of patients. This proportion was found to be similar between home HD and in-center HD patients. Erythropoiesis-stimulating agents (ESA) were currently used by most patients, with a slight increase in usage compared to the previous year. Iron treatment was used by 55.03% of the patients. Drug treatment for secondary hyperparathyroidism was used by 58.82% (IV vitamin D 43.19%, vitamin D analogs 19.65%, calcimimetics 11.9%, oral vitamin D

10.53%, different combinations 14.73%). The most used phosphate binder agent was calcium acetate (35.24%), followed by sevelamer (21.21%), calcium carbonate (18.12%), and lanthanum (4.89%). Phosphate binders were not used by 19.37% of the patients.

Hepatitis B virus (HBV) surface antigen (HBsAg) was positive in 2.45% of the patients, and anti-hepatitis C virus (HCV) antibody was positive in 2.29% of the patients; double positivity was observed in 0.25% of the patients. The prevalence of HCV is decreasing. There were 142 patients with human immunodeficiency virus (HIV) positivity (0.23%), indicating a noticeable increase compared to previous years.

Cardiovascular diseases were the most common cause of death (39.55%), followed by infections (13.41%), cerebrovascular causes (12.72%), and malignancy (8.05%).

The number of patients on home HD is increasing. As of the year 2023, there is a total of 1331 patients on home HD, and 240 of them are incident patients. The most common dialysis session duration for home HD patients was 7.1-8 hours (51.55%). Compared to in-center HD, home HD patients had a higher proportion of Kt/V >1.4, a lower rate of phosphate binder use, a lower rate of ESA use, and a higher proportion of patients achieving blood pressure <140/90 mmHg without antihypertensive drugs.

Peritoneal Dialysis

As of the end of the year 2023, the total number of PD patients was 3678, similar to the previous 2 years, a slight increase in the number of PD patients was observed following a decade-long decreasing trend. Male patients constituted 48.54% of the cases. The age distribution can be seen in Table 1. The total number of incident patients for the year 2023 was 1364. The most common cause of incident ESKD was diabetes mellitus in 35.29% of the cases, followed by hypertension in 32.28%, glomerulonephritis in 6.46%, and polycystic kidney disease in 3.45%. Unlike previous years when lower rates were reported, the rate of diabetes among incident PD patients increased in 2023 and was found

Table 1. Age Distribution of Hemodialysis, Peritoneal Dialysis, and Transplantation Patients					
Age, years	0-19	20-44	45-64	65-74	75+
Hemodialysis (%)	0.7	11.7	38.8	28.9	19.9
Peritoneal dialysis (%)	12.6	21.7	40.9	17.6	7.2
Transplantation (%)	8.2	49.1	38.5	4.0	0.2
The presented data are for the prevalent dialysis patients and for incident transplantation patients.					

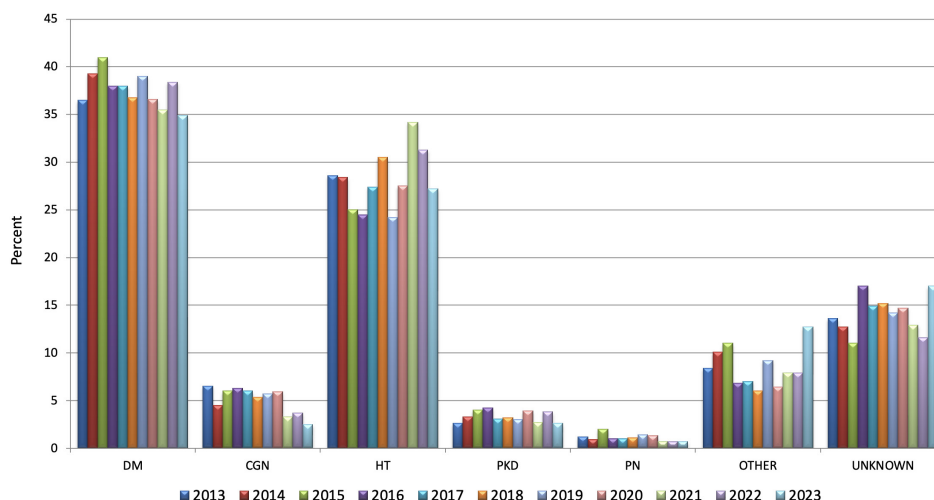


Figure 3. Primary etiological kidney disease of patients on kidney replacement therapy by years. CGN, chronic glomerulonephritis; DM, diabetes mellitus; HT, hypertension; PKD, polycystic kidney disease; PN, pyelonephritis.

to be similar to that in HD patients. This finding needs to be followed up in the coming years. The etiology was unknown in 8.71% of the cases. The frequency of hypertension was high; however, it is not possible to differentiate between primary and secondary hypertension due to kidney disease.

Blood pressure was above the target limit of 140/90 mmHg in 23.51% of the patients. Changes in treatment-related parameters are summarized in Table 3. Albumin, a critical nutritional marker, was below 3.5 g/dL in 22.79% of PD patients, with hypoalbuminemia remaining in the range of 20%-30%

Table 2. Variation of the Technical Characteristics of Hemodialysis Treatment Over the Years (Data Represent Percentage of Patients)*

Years	2009	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Vascular access												
AV fistula	84.0	82.9	81.1	80.4	79.1	78.7	77.4	76.5	74.7	72.4	70.9	70.0
Tunneled catheter	9.3	11.7	13.4	14.4	15.6	18.0	19.1	20.3	21.6	23.6	24.8	25.4
AV graft	2.7	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.0	1.0	0.9	0.7
Other	4.0	3.6	3.9	3.8	3.9	2.1	2.3	2.1	2.7	3.0	3.5	3.8
Dialyser type												
Synthetic	65.0	58.9	-	-	-	-	-	-	-	-	-	-
Semi-synthetic	14.0	7.0	-	-	-	-	-	-	-	-	-	-
High-flux	21.0	34.1	33.3	36.3	45.6	46.2	46.3	47.6	76.1	77.6	76.0	77.8
Low-flux	-	-	66.7	63.7	54.4	53.8	53.7	52.4	23.9	22.4	24.0	22.2
Dialysis frequency												
Once per week	0.9	0.6	0.6	0.5	0.5	0.6	0.7	0.5	0.6	0.4	0.5	0.6
Twice per week	7.0	7.7	7.9	8.0	8.7	10.0	10.3	10.8	11.4	11.7	12.1	12.9
Three times per week	90.1	90.1	90.8	90.7	89.7	88.3	88.0	87.8	86.8	86.8	86.3	85.4
More than 3 times per week or night HD	2.0	0.7	0.8	0.8	1.1	1.1	1.0	1.0	1.2	1.1	1.1	1.1
Kt/V value												
≤1.20	10.2	11.0	11.3	9.8	8.3	8.4	7.4	7.0	13.4	15.2	15.9	9.0
>1.20	89.8	89.0	88.7	90.2	91.7	91.6	92.6	92.9	86.6	84.8	84.1	91.0

*Years that are not available or incompatible with other reports due to differences in data collection are left blank. AV, arteriovenous; HD, hemodialysis.

Table 3. Hypoalbuminemia Rate and Treatment Characteristics in Dialysis Patients(Data Represent Percentage of Patients)												
Years	2009	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Hemodialysis												
Hypoalbuminemia (<3.5 g/dL)	11.1	13.0	15.2	13.4	10.1	12.9	10.5	7.4	13.8	14.0	7.2	6.8
ESA use	62.4	70.6	55.3	55.3	54.0	54.6	49.3	53.5	59.2	57.2	56.5	59.1
Iron treatment	55.0	59.0	55.8	53.5	51.4	55.9	57.2	60.6	63.0	57.1	56.0	55.0
Active vitamin D use*	45	43.6	43.0	58.2	58.2	57.5	58.6	63.8	61.1	57.8	57.1	58.8
Peritoneal dialysis												
Hypoalbuminemia (<3.5 g/dL)	30.8	28.8	24.9	24.6	30.1	26.2	26.1	28.4	22.8	21.1	26.6	22.8
ESA use	53.5	59.7	44.9	43.3	48.5	46.6	52.2	46.1	48.5	47.0	43.0	47.4
Iron treatment	51.0	52.1	47.7	55.3	43.6	44.0	50.4	42.2	43.9	41.2	35.9	34.3
Active vitamin D use*	56.8	55.9	59.1	67.5	68.3	66.2	68.7	64.1	60.8	61.2	56.1	58.5
*Following 2015, the use of drugs for the treatment of secondary hyperparathyroidism. ESA, erythropoiesis-stimulating agents.												

over the last decade. Erythropoiesis-stimulating agents were used by approximately half of the patients. Iron treatment was used by 34.34% of the patients; most PD patients had used iron via the oral route (63.58%). Drug treatment for secondary hyperparathyroidism was used by 58.45% of the patients (oral vitamin D by 51.62%, calcimimetics by 15.85%, vitamin D analogs by 18.72%, and intravenous vitamin D by 1.39%). The most used phosphate binders were calcium carbonate (34.45%), followed by calcium acetate (18.94%) and sevelamer (16.2%).

Hernia (6.75%) was the most common complication excluding peritonitis; it was followed by ultrafiltration failure (3.81%), inadequate dialysis (3.44%), external cuff extrusion (3.31%), and dialysate leakage (3.31%).

Hepatitis B virus surface antigen positivity was present in 2.28%, and anti-HCV positivity was present in 0.9%. There were no HIV-positive patients.

The most common cause of death was cardiovascular disease (46.45%), followed by infection (7.65%), and cerebrovascular disease (6.56%).

Transplantation

According to the data provided by the Turkish Ministry of Health during the year 2023, 3452 kidney transplants were performed. It is observed that the total number of transplants has decreased compared to the previous year (3621) and appears to have started plateauing. Recipients were generally male (65.82%). Their age distribution is shown in Table 1.

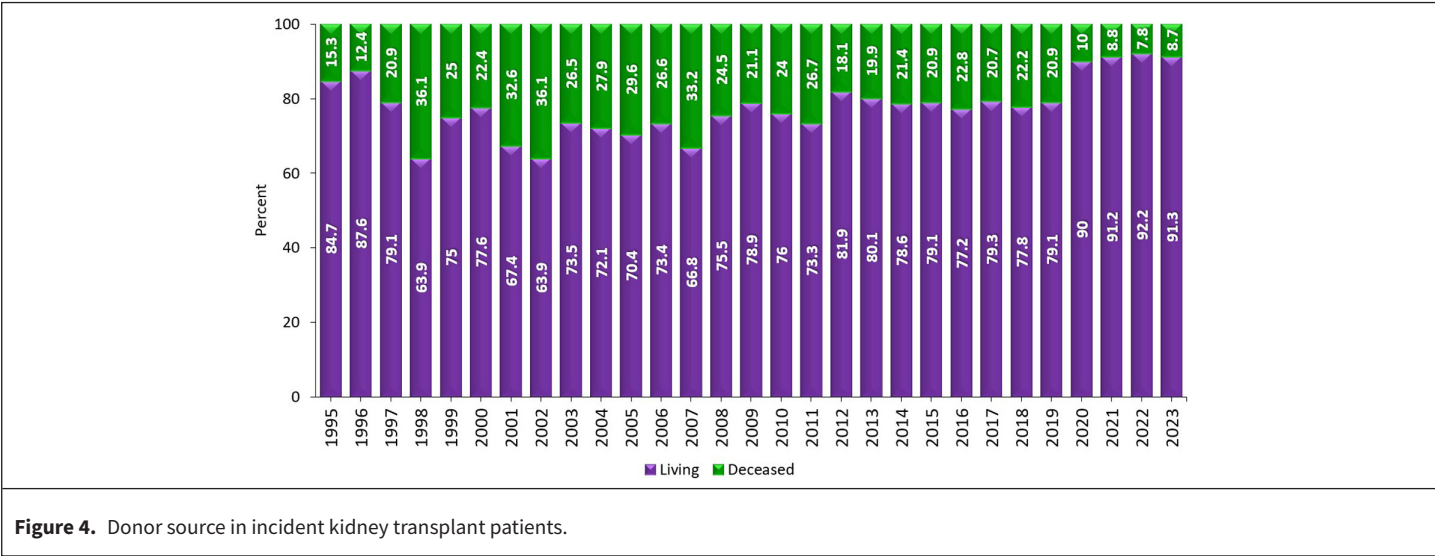


Figure 4. Donor source in incident kidney transplant patients.

Most of the cases were aged between 20 and 44 years. Most of the transplantations were performed using living donors (91.28%). First-degree relatives were the most common source of living donors (35.61%), followed by spouses (22.09%) and second-degree relatives (21.83%). The incidence of non-related donors was 7.81%.

The rate of cadaveric transplantation was 8.72% and has remained below the 10% threshold over the past 2 years, which is a concerning trend. Longitudinal data regarding donor type is shown in Figure 4. The most common cause of kidney failure was hypertension (22.29%), followed by diabetes mellitus (14.96%), glomerulonephritis (14.04%), and polycystic kidney disease (6.81%). Primary etiology was not known in 20.95% of the cases. It should be noted that hypertension might be secondary, at least in some cases. Previous KRT type was HD in 38.5% of the patients and PD in 3.53%. The high rate (57.97%) of preemptive transplantation should be noted. The trend showing the increasing preemptive transplantation rate over the years is shown in Figure 5.

The prognosis of the new transplantations was evaluated according to the data of 3452 transplantations. A total of 89 deaths were reported in the new transplantations in the same year, with a mortality rate of 2.32% for live donors and 5.32% for cadaveric donors, showing an improvement compared to the previous year. Besides, when evaluating these figures, it should be kept in mind that the number of live donors in our country is high. Additionally, the rate of patients with functional grafts in the first year, particularly in live donor transplants, was 96.4%, which is a positive finding.

DISCUSSION

It may be more accurate to consider the trend-forming changes when examining the change in registry data over the years. Many different reasons can cause annual volatilities not associated

with actual change: data collection methods, center features, and data set properties.

A clear trend of increase was seen in the number of prevalent KRT patients. In the year 2023, the number of incident HD patients was similar to that of the previous year. The number of prevalent HD patients, including those on home HD, also increased compared to last year.

Especially, there is a remarkable reduction in incidence in the year 2012. Since 2012, incidence and prevalence calculations have been done using patient-based data collected by the Turkish Ministry of Health. Before the year 2012, center-based data collected by the Turkish Society of Nephrology was used. We suggest that changes in data collection methods in recent years could be a significant cause of this noticeable change in incidence numbers. In line with this suggestion, in the previous 10 years, a nearly sideways trend is observed in incidence data.

Epidemiological studies in our country have shown that the rate of diabetes mellitus has increased approximately 2-fold in the last 10 years.^{2,3} Similar to other countries, diabetes mellitus and diabetic nephropathy remain serious problems in patients with chronic kidney disease (CKD). The mean age of these patients is higher than other patients, and the prevalence of vascular access failures and cardiovascular disease is much higher than in non-diabetic patients due to widespread and severe vascular disease. Hemodialysis is the most common form of KRT; distortion in some quantitative and qualitative aspects of this treatment was noted this year. The number of prevalent patients on HD has increased, while the number of incident patients remained stable. The number of home HD patients has increased to 1331, and it is noteworthy that there is an increase compared to the previous year (1257). The number of patients with acceptable Kt/V and the number of patients

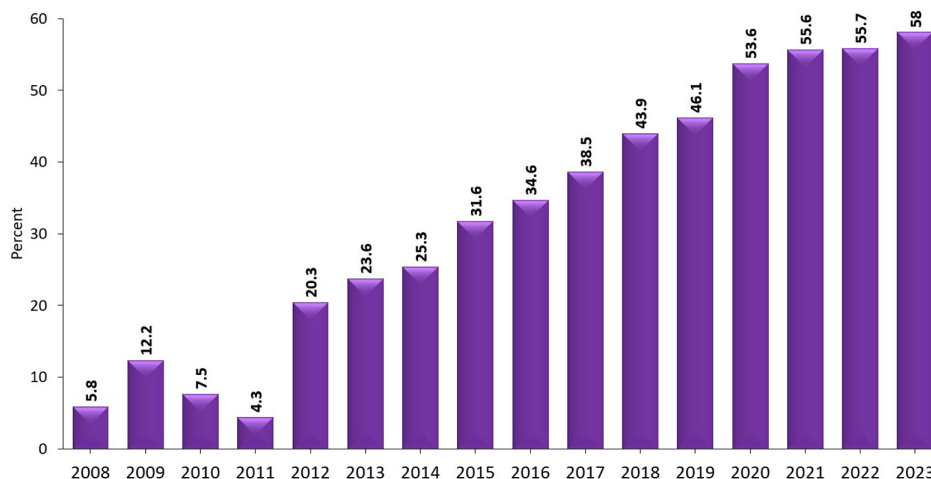


Figure 5. Preemptive transplantation rates by year.

with low albumin levels were improved compared to those of the last year.

As of the end of 2023, the most commonly used vascular access method in center-based HD patients was the AV fistula, although this rate has declined to around 70%. The high utilization of AV fistulas in chronic patients is a desirable condition. However, there has been a continued trend of decreasing fistula usage rates in recent years. This trend may be associated with an increase in diabetic and elderly patients with problematic vascular structures. Efforts should be made to prevent this trend from leading to a fundamental change in the routine creation of vascular access.

There was a clear trend of a decrease in PD patient numbers from 2006 until 2019, probably due to both a lack of new patient recruitment and an increase in preemptive transplantation activity. Following a decade-long decreasing trend, we observed an increase in the number of prevalent PD patients in the last 5 consecutive years (3292 in 2019, 3387 in 2020, in 2021, 3552 in 2022, and 3678 in 2023). This should be monitored before declaring the end of this decade-long decreasing trend. Peritoneal dialysis was started as the first KRT for a total of 1364 patients in 2023. After a steady increase in the number of incident PD patients over the last 5 years, the number of incident patients this year is similar to last year. It is noteworthy that incident PD patients are younger than incident HD patients. Unlike previous years when lower rates were reported, the rate of diabetes in incident PD patients in 2023 was found to be similar to that in HD patients; which needs to be followed up in the coming years. In contrast to the high rate in HD (39.7% in 2023), only 15.5% of incident PD patients were started on dialysis in an urgent setting. However, literature data suggest that PD is at least as safe an option as HD in patients who start dialysis in urgent conditions. Approximately 75% of the prevalent PD patients are observed to be hypertensive. The rate of hypertensive patients is higher in PD than in HD. This high rate suggests that volume control should be improved in PD patients. Serum albumin level is below 3.5 g/dL in 22.79% of patients. The rate of patients with hypoalbuminemia decreased compared to the previous year (26.62%). As in previous years, phosphorus control in PD patients is found to be satisfactory. Serum phosphorus level is above 5.5 mg/dL in only 27% of patients. About 71.2% of patients use phosphorus-binding drugs. This rate is slightly lower than HD patients (80.6%). Similar to last year, calcium carbonate was the most preferred phosphorus binder among PD patients who were using phosphate binders (34.5%).

The rate of transplantation from a cadaveric donor is 8.72%. The decline in the cadaveric transplant rate observed during the coronavirus disease 2019 pandemic continues. There is a significant drop in cadaveric transplant activity, which remains below the 10% threshold. Increasing the rate of cadaveric transplants may require efforts such as raising public awareness

through social media campaigns and educational initiatives to inform the community about the importance of organ donation. Additionally, financial neutrality can be provided by the state. The rate of preemptive transplantation is 58%, showing an increase compared to last year (55.7%). This high rate raises some concerns about whether all transplants are being performed at the appropriate time.

In terms of the number of living transplants, Türkiye has reached the top rankings globally, according to many metrics. Choosing the appropriate live donor is very important. In 2023, 7.81% of living donor kidney transplants were from unrelated donors, and 4.9% were paired kidney exchanges. Compared to the previous year, a notable decrease was observed in transplants from unrelated donors (17% last year) and in the rate of paired kidney exchanges (6.3% last year). Ethical compliance in those cases should be carefully monitored.

The low rate of cadaveric kidney transplantation is a continuing problem in organ donation. Additionally, mortality and graft loss rates in cadaveric donor transplantations are significant problems during the first year and should be closely monitored. However, an improvement in first-year mortality rates has been observed in cadaveric donor transplants compared to the previous year.

Registry data provide information about patients receiving KRT for CKD. We want to emphasize that these patients are like the visible part of the iceberg, and the number of patients in earlier stages of CKD is much higher. The CREDIT study revealed that CKD is a significant public health problem for our country.² To address these health problems, the Turkish Ministry of Health initiated the national kidney disease prevention program. This program aims to prevent and enable early diagnosis of CKD, slow its progression, and provide effective treatment. Additionally, the quality of KRT continues to improve each year and is nearly universally accessible in our country.

Data Availability Statement: The data summarized in this manuscript are publicly available in the booklet “Registry of the Nephrology, Dialysis, and Transplantation in Türkiye, Registry 2023” published by the Turkish Society of Nephrology. The full report and previous years’ data can be accessed at www.tsn.org.tr or www.nefroloji.org.tr.

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