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Original Article

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Current Status of Kidney Replacement Therapy in Türkiye: A Summary of 2021 Turkish Society of Nephrology Registry Report

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ABSTRACT

Objective: Turkish Society of Nephrology registry collects data on hemodialysis, peritoneal dialysis, and transplantation annually. Registry reports are printed every year as a booklet, and this is the 32nd year of registry reports. The registry is in close collaboration with international registries.
Methods: In this paper, we summarized data from the 2021 registry report and provided yearly trends for managing end-stage kidney disease.
Results: The number of patients on kidney replacement therapy increases; at the end of 2021, 84 128 patients were on kidney replacement therapy. The prevalence and incidence of end-stage kidney disease were 993.5 and 149.5 per million population, respectively. Diabetes was the most common cause of end-stage kidney disease. Hemodialysis (71.4%) was the most common type of treatment modality, followed by transplantation (24.6%) and peritoneal dialysis (4.0%).
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, hemodialysis, kidney replacement therapy, kidney transplantation, peritoneal dialysis , registry

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INTRODUCTION

Turkish Society of Nephrology's renal registry (Turkish renal registry) was founded in 1990 by Prof. Dr. Ekrem Erek, and this is its 32nd anniversary. Center-based data were first collected with paper documents until 2007; since then, data were collected using electronic forms via the internet. Data regarding kidney replacement therapies (KRTs), including hemodialysis (HD), peritoneal dialysis (PD), and kidney transplantation, are collected every year. Data on specialized topics such as clinical nephrology (pre-dialysis care), acute kidney injury, and kidney pathology are also collected in selected years. Data from the Turkish renal registry are shared with and published in the United States Renal Data System and European Renal Association-European Dialysis and Transplantation Association registry.

In the year 2020, the most important global event was the new type of coronavirus (severe acute respiratory syndrome coronavirus 2) infection [coronavirus disease 2019 (COVID-19)] pandemic. The pandemic had effects on every aspect's health care as well as daily life. The effects of the pandemic stretched to the year 2021, and accordingly, registry data show several significant changes in KRT-related data in the year 2021, probably reflecting the effect of the pandemic on our patient population.

METHODS

In this manuscript, we provide a summary of the 2021 registry report.[1] More comprehensive and detailed data can be found in the booklet "Registry of the Nephrology, Dialysis, and Transplantation in Türkiye, Registry 2021" published by the Turkish Society of Nephrology. Current and previous reports can be accessed from the website of the Turkish Society of Nephrology (www.tsn.org.tr or www.nefroloji.org.tr).

We collected data from selected KRT centers; moreover, we extensively used a database under health ministry supervision to obtain complete data. This approach is used since the year 2012.

RESULTS

Incidence and Prevalence

At the end of the year 2021, there were a total of 84 128 patients who were on KRT. Following a yearly pause, the number of patients on KRT increased again during the year 2021. The most common type of KRT is HD (71.4%), followed by transplantation (24.6%) and PD (4.1%). Incidence was calculated as 149.5 per million population (pmp) and prevalence was calculated as 993.5 pmp. Yearly changes in incidence and prevalence are shown in Figures 1 and 2. Although the prevalence was in a long-term and stable increasing trend, a decrease in prevalence was noted since the year 2020.

MAIN POINTS

- Incidence of patients on kidney replacement therapy in 2021 was 149.5.
- Prevalence of patients on kidney replacement therapy in 2021 was 993.5.
- The primary etiology was diabetes mellitus (DM) in the prevalent hemodialysis patients (35.6%).
- Cadaveric kidney transplantation in 2021 was 298.
- Preemptive transplantation rate in 2021 was 1875.

Hemodialysis

The number of HD patients continues to increase, and, at the end of 2021, there were 60 051 patients with HD. Like the previous year, we noted a decrease in the absolute number of HD patients this year, and the share of HD among KRT is decreasing (81.7% in 2017 and 71.4% in 2021). The age distribution of in-center HD patients is shown in Table 1. It should be noted that more than 50% of the HD population is composed of elderly patients. The number of incident HD patients is 9517. The incident HD patients increased compared to last year (9081). The most common causes of kidney disease among the incident patients are diabetes mellitus (DM) (35.6%), followed by hypertension (34.2%), glomerulonephritis (3.3%), polycystic kidney disease (2.8%), and other causes. Primary etiology is undetermined in 12.9% of the patients. DM frequency remains stable in the last 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. The incidence of diabetes is increasing with age.

The most common type of vascular access at the initiation of HD was tunneled catheters in 50.9%, followed by arteriovenous fistulae in 27.6%, temporary catheters in 21.1%, and arteriovenous grafts in 0.4%. Longitudinal data regarding characteristics of hemodialysis treatment are shown in Table 2. The arteriovenous fistula was the most common type of access in prevalent patients (72.4%); however, the increasing use of catheters should be noted. The most common access site for temporary

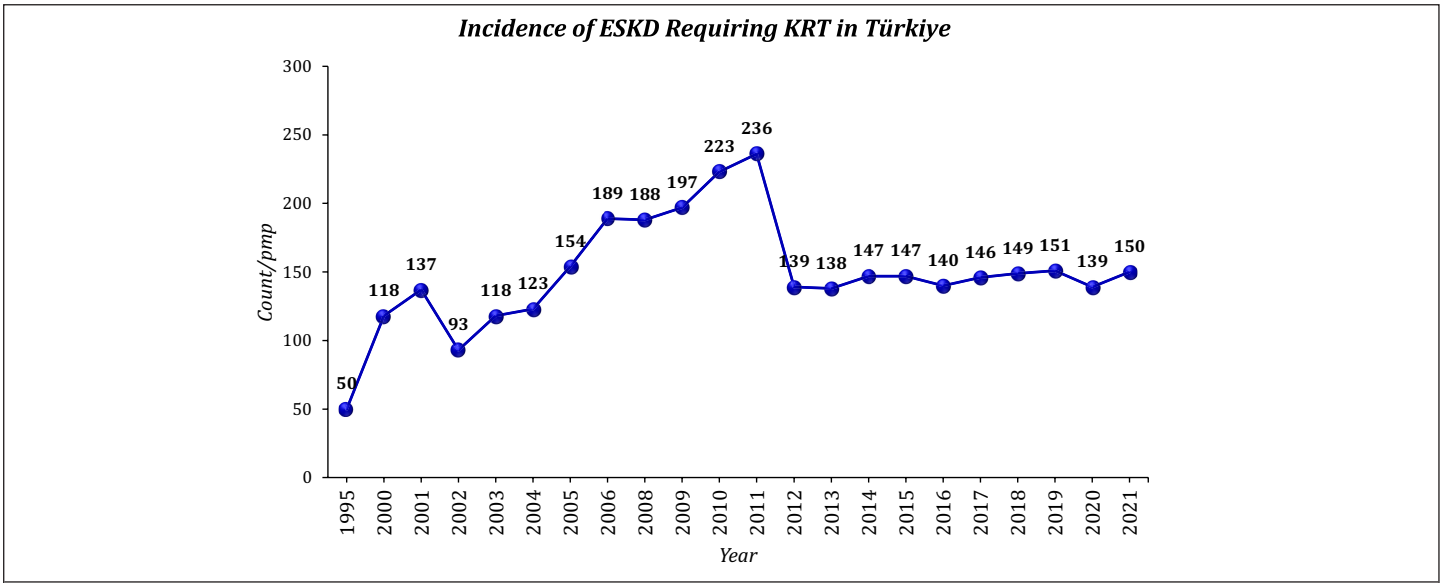

Figure 1. Incidence of patients on KRT by years. Since 2012, patient-based data provided by the Ministry of Health is used for the calculations.

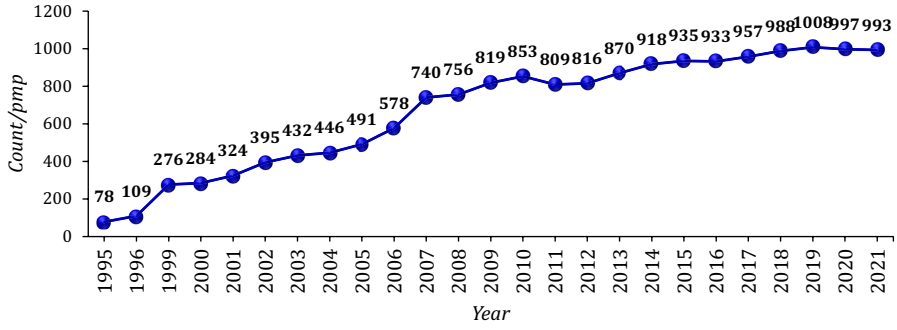

Figure 2. Prevalence of patients on KRT by years. Since 2012, patient-based data provided by the Ministry of Health is used for the calculations.

catheter placement was the internal jugular vein (51.3%), followed by the femoral (23.2%) and subclavian (13.3%) veins.

Technical changes regarding HD treatment are shown in Table 2, and increased use of high-flux membranes should be noted. The frequency of HD was 3 times/week in most of the patients (Table 2). This year in contrast to the previous trend of increase in *Kt*/*V* values, a decrease in *Kt*/*V* is observed (Table 2); as of the end of 2021, *Kt*/*V* is over 1.4 in 67.5 of the patients.

A blood pressure target of <140/90mmHg was achieved in 76.2% of HD patients, either with antihypertensive treatment or without antihypertensive treatment. Yearly changes in various parameters regarding HD treatment are listed in Table 3. The frequency of patients with hypo-albuminemia was decreased; as of the year 2021, albumin level was above 4.0 g/dL in 62.6%. Erythropoiesis stimulation agents were currently used in 57.2% of the patients, and were previously used in 24.2%. Iron treatment was used by 57.1% of the patients. Drug treatment for secondary hyperparathyroidism was used by 57.7% intravenous (IV) vitamin D 46.2%, vitamin D analogs 21.1%, calcimimetics 8.7%, oral vitamin D 10.1%, and different combinations 13.9%). The most used phosphate binder agent was calcium acetate (41.7 %), followed by sevelamer hydrochloride (23.1%), calcium carbonate (14.5%), and lanthanum carbonate (3.2%). Phosphate binders were not used by 19.7% of the patients.

Hepatitis B virus surface antigen was positive in 2.5% of the patients, anti-hepatitis C virus (HCV) antibody was positive in 2.6% of the patients, and double positivity was observed in 0.1% of the patients. The prevalence of HCV is decreasing. There were 37 patients with HIV positivity.

Cardiovascular diseases were the most common cause of death (33.8%), followed by infections (26.4% COVID-19), cerebrovascular causes, and malignancy.

The number of patients in home HD is increasing. As of the year 2021, there are a total of 1107 patients on home HD, and 154 of them are incident patients.

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	12.6	39.1	29.0	18.6
Peritoneal dialysis (%)	15.7	24.2	39.5	16.4	4.1
Transplantation (%)	10.1	50.2	35.8	3.7	0.2

The presented data are for the prevalent dialysis patients and for incident transplantation patients.

Peritoneal Dialysis

At the end of 2021, the total number of PD patients was 3417; similar to the previous 2 years, a slight increase in the number of PD was observed following a decade-long decrease trend. Male patients consisted 47.4% of the cases; the age distribution can be seen in Table 1. The total number of incident patients for the year 2021 was 1269. The most common cause of incident end-stage kidney disease was DM in 25.1% of the cases, followed by hypertension in 33.0%, glomerulonephritis in 6.1%, and polycystic kidney disease in 1.8%. The etiology was unknown in 11.4% 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 28.9% 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 21.1%, and it was above 4.0 g/dL in 21.0% of the cases. During the last decade, hypoalbuminemia frequency was in the range of 25%-30%. Erythropoiesis-stimulating agents were currently used by 47.0% of the patients; 19.3% of them had previously used those agents. Iron treatment was used by 41.3% of the patients; most PD patients had used iron using the oral route (67.6%). Drug treatment for secondary hyperparathyroidism was used by 61.2% of the patients (oral vitamin D by 59.1%, calcimimetics by 13.5%, vitamin D analogs by 16.1%, and intravenous vitamin D by 0.6%). The most used phosphate binders were calcium acetate (30.1%),

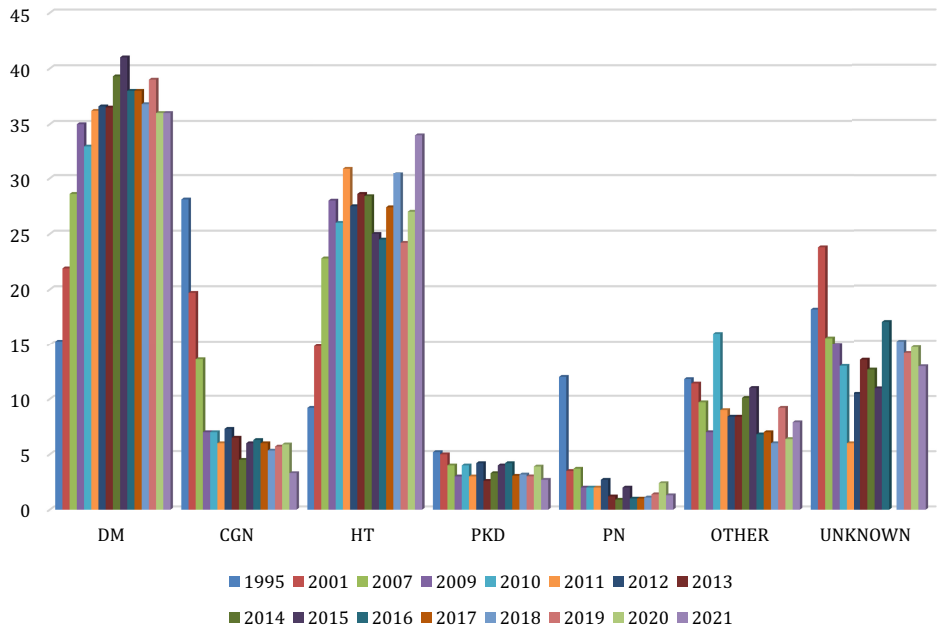

Figure 3. Primary etiological kidney disease of patients on KRT by years. CGN, chronic glomerulonephritis; DM, diabetes mellitus; HT, hypertension; PKD, polycystic kidney disease; PN, pyelonephritis.

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

Years	2007	2008	2009	2013	2014	2015	2016	2017	2018	2019	2020	2021
Vascular access												
AV fistulae	86.0	85.4	84.0	82.9	81.1	80.4	79.1	78.7	77.4	76.5	74.7	72.4
Permanent catheter	7.0	7.7	9.3	11.7	13.4	14.4	15.6	18.0	19.1	20.3	21.6	23.6
AV graft	2.9	2.9	2.7	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.0	1.0
Other	4.1	4.0	4.0	3.6	3.9	3.8	3.9	2.1	2.3	2.1	2.7	3.0
Dialyzer type												
Synthetic	67.2	60.3	65.0	58.9	—	—	—	—	—	—	—	—
Semi-synthetic	19.1	17.6	14.0	7.0	—	—	—	—	—	—	—	—
High flux	13.7	21.8	21.0	34.1	33.3	36.3	45.6	46.2	46.3	47.6	76.1	77.6
Cellulose-based	0.0	0.3	0.0	0	—	—	—	—	—	—	—	—
Dialysis frequency												
Once per week	0.9	0.9	0.9	0.6	0.6	0.5	0.5	0.6	0.7	0.5	0.6	0.4
Twice per week	7.8	7.5	7.0	7.7	7.9	8.0	8.7	10.0	10.3	10.8	11.4	11.7
Tree times per week	89.9	90.2	90.1	90.1	90.8	90.7	89.7	88.3	88.0	87.8	86.8	86.8
More than 3 times per week or night HD	1.4	1.4	2.0	0.7	0.8	0.8	1.1	1.1	1.0	1.0	1.2	1.1
Kt/*V* value												
<1.20	12.7	11.3	10.2	11.0	11.3	9.8	8.3	8.4	7.4	7.0	13.4	15.2
≥1.20	87.3	88.8	89.8	89.0	88.7	90.2	91.7	91.6	92.6	92.9	86.6	848

*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

Year	2007	2008	2009	2013	2014	2015	2016	2017	2018	2019	2020	2021
Hemodialysis												
Hypoalbuminemia (<3.5 g/dL) (%)	12.0	11.7	11.1	13.0	15.2	13.4	10.1	12.9	10.5	7.4	13.8	14.0
ESA use (%)	61.8	62.7	62.4	70.6	55.3	55.3	54.0	54.6	49.3	53.5	59.2	57.2
Iron treatment (%)	54.7	54.8	55.0	59.0	55.8	53.5	51.4	55.9	57.2	60.6	63.0	57.1
Active vitamin D use (%)*	36.9	41.1	45	43.6	43.0	58.2	58.2	57.5	58.6	63.8	61.1	57.8
Peritoneal dialysis												
Hypoalbuminemia (<3.5 g/dL) (%)	28.1	25.1	30.8	28.8	24.9	24.6	30.1	26.2	26.1	28.4	22.8	21.1
ESA use (%)	54.1	51.8	53.5	59.7	44.9	43.3	48.5	46.6	52.2	46.1	48.5	47.0
Iron treatment (%)	60.0	47.9	51.0	52.1	47.7	55.3	43.6	44.0	50.4	42.2	43.9	41.2
Active D use (%)*	37.6	37.6	56.8	55.9	59.1	67.5	68.3	66.2	68.7	64.1	60.8	61.2

*Following 2015, the use of drugs for the treatment of secondary hyperparathyroidism. Erythropoiesis-Stimulating Agents (ESA).

followed by calcium carbonate (28.2%) and sevelamer hydrochloride (23.2%).

Hernia (6.8%) was the common complication excluding peritonitis; it is followed by obesity (4.4%), inadequate dialysis (4.8%), dialysate leakage (3.5%), and ultrafiltration failure (4.8%).

Hepatitis B virus surface antigen positivity was present in 1.9%, and anti-HCV positivity was present in 1.0%. There were no HIV-positive patients.

The most common cause of death was cardiovascular disease (35.9%), followed by infection (42.3%, 30.1% of this) and cerebrovascular disease (9.2%).

Transplantation

Kidney transplantation in Türkiye over the years is gradually increasing. According to the data provided by the Ministry of Health during the year 2021, 3375 kidney transplantations were performed. Compared to the previous year, this corresponds to an increase of 35.0% Recipients were generally male (66.2%). Their age distribution is shown in Table 1. Most of the cases were aged between 20 and 44 years. Most of the transplantations were performed using living donors (91.2%). First-degree relatives were the most common source of living donors (35.5%), followed by paired exchange (17.7%). The incidence of non-related donors was 6.5%.

The rate of cadaveric transplantation was 8.8%; longitudinal data regarding donor type are shown in Figure 4. The most

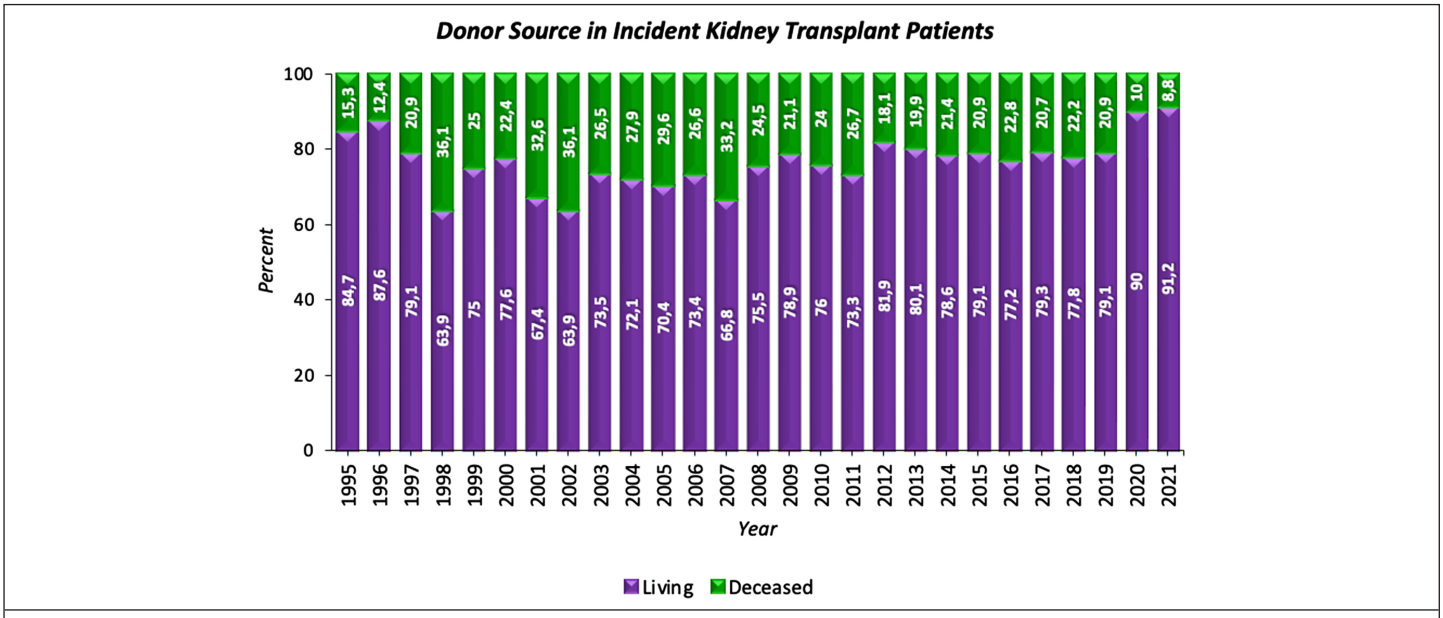

Figure 4. Cadaveric kidney transplantation rate by years.

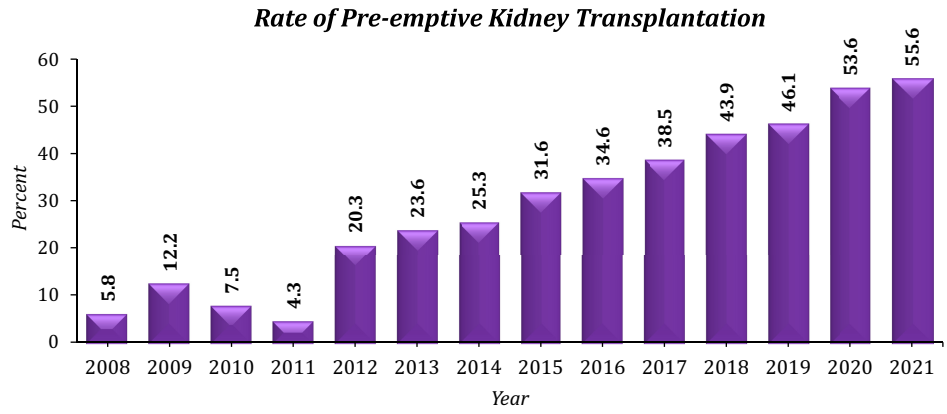

Figure 5. Preemptive transplantation rates by years.

common cause of kidney failure was DM (19.4%), followed by hypertension (17.9%), glomerulonephritis (13.7%), and polycystic kidney disease (8.3%). Primary etiology was not known in 20.9% of the cases. It should be noted that hypertension might be secondary, at least in some cases. Previous KRT type was HD in 40.2% of the patients and PD in 4.3%. The high rate (55.6%) of preemptive transplantation should be noted; the trend showing the increased rate (55.6%) of preemptive transplantation is remarkable; 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 3375 transplantations. A total of 139 deaths were reported in the new transplantations in the same year, with a mortality rate of 3.4% for living donors and 11.1% for cadaveric donors.

DISCUSSION

It may be more accurate to consider the trend-forming changes when examining the change in the registry data over the years. Many different reasons can cause annual volatilities not associated with actual change: data collection method, center features, and data set properties. However, similar to 2020, 2021 was a special year because of the COVID-19 pandemic, and important changes are observed in many aspects of KRT. The first COVID-19 case in our country was officially declared on March 11, 2020. Coronavirus disease 2019 has had a negative impact on the morbidity and mortality of patients undergoing KRT.

A clear trend of the increase was seen in the number of prevalent KRT patients. However, the rate of growth in prevalence started to decrease in the last 2 years.The trend in the number of incident patients was not as clear. Specifically, there is a remarkable reduction in incidence in the year 2012. Since 2012, incidence and prevalence calculations are done using patient-based data collected by the Ministry of Health. In previous years, center-based data collected by the Turkish Society of Nephrology were used. We suggested that changes in data collection methods in the last years could be a significant cause of this noticeable change in incidence numbers. In line with this suggestion, in the previous 9 years, a nearly sideways trend is observed in incidence data.

Epidemiological studies such as CREDIT and TURDEP have shown that the rate of DM has increased approximately 2-fold in our country in the last decade.[2,3] The rate of diabetes is around 35% in incident HD patients. These data show that DM and diabetic nephropathy have become the first item on the nephrology agenda. The mean age of these patients is higher than other patients. Also, the frequency of vascular access failure is much higher in the diabetic population 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 both incident and prevalent patients on HD decreased. A feasible interaction of the pandemic might be considered. The number of home HD patients has increased from 895 to 1107, and it is noteworthy that there is a significant increase compared to the previous year. Due to the pandemic, home dialysis options may have been preferred more. The number of patients with acceptable *Kt*/*V* and the number of patients with low albumin levels were improved compared to those of the last year.

There was a clear trend of a decrease in the number of PD patients from 2006 to 2019. The formation of this trend, especially the lack of new patient recruitment and the increase in preemptive transplantation activity, seems to be causative. Following a decade-long decreasing trend, we monitored an increase in the number of PD patients in the last 3 consecutive years. However, in the last 2 years, PD might be preferred because of the pandemic; additionally, kidney transplantation activity was significantly decreased because of the pandemic, and this might be an additional factor for the increase of PD. Because probably kidney transplant candidates are also eligible for PD. The increase that we observed in the last 3 years

should be monitored before declaring the end of this decade-long decrease trend.

Several parameters suggest that COVID-19 has a critical impact on kidney transplantation. The total number of transplants has decreased significantly compared to the previous year. Suspension of kidney transplant activity due to the pandemic has been effective in many centers. The rate of transplantation from a cadaveric donor is 10%. This rate reveals that there is a considerable decrease in cadaveric transplantation activity, which is generally in the 18%-25% range and is already low. The rate of preemptive transplantation is even higher this year compared to that of the last year (53.6% vs. 55.6%). Those high numbers raise some concerns about the correct timing of transplantation.

In terms of the number of living transplants, Türkiye has reached the top rankings globally, according to many metrics.[4] The selection of the appropriate living donor is very crucial. In 2021, 6.5% of living donor transplantations were performed fom unrelated donors. Ethical compliance in those cases should be attentively monitored.

The low rate of cadaveric kidney transplantation is a continuous problem of organ donation. Furthermore, particularly in cadaveric donor transplantations, mortality and graft failure rates are seen as significant problems in the first year and should be closely monitored.

To increase kidney transplantation, which is the ideal treatment in terms of mortality, patient well-being, and cost-effectiveness, establishing an active organization between the university, the Ministry of Health, and the community is essential for our patient's health and the national economy. The state can ensure numerous advantages to the family of cadaveric donors.

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]

CONCLUSION

The quality of KRT is improving each year, and it is nearly universally accessible in our country. The Registry studies and the CREDIT study have shown that CKD and naturally ESKD (End stage kidney disease) are some of our country's most critical health problems. To address those health problems the Ministry of Health initiated the national kidney disease prevention program. This program aims to prevent and early diagnose CKD, slow CKD progression, and treat CKD.

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