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Original Article

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# Current Status of Renal Replacement Therapy in Turkey: A Summary of the 2019 Turkish Society of Nephrology Registry Report

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## ABSTRACT

**Objective:** The 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 30th year of registry reports. The registry is in close collaboration with international registries.
**Material and Methods:** In this article, we have summarized data from the 2019 registry report; additionally, we have also provided yearly trends of managing end-stage kidney disease.
**Results:** The number of patients on renal replacement therapy has increased, and by the end of 2019, 83 738 patients were on renal replacement therapy. The prevalence and incidence of end-stage renal disease were 1007.6 and 150.5 per million population, respectively. Diabetes was the most common cause of end-stage renal disease. Hemodialysis (73.2%) was the most common type of treatment modality, followed by transplantation (22.9%) and peritoneal dialysis (3.9%).
**Conclusion:** End-stage kidney disease is a critical and growing health problem for our country. The Renal 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, renal replacement therapy, hemodialysis, peritoneal dialysis, renal transplantation, registry

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## INTRODUCTION

Unfortunately, this year Prof. Dr. Ekrem Erek, founder of the Turkish Society of Nephrology's renal registry (Turkish Renal Registry), passed away. He founded the registry in 1990, and this year is its 30th anniversary. Center-based data was first collected with paper documents until 2007; since then, data were collected using electronic forms via the internet. Data regarding renal replacement therapies (RRT), including hemodialysis, peritoneal dialysis, and transplantation, are collected every year. Data on specialized topics such as clinical nephrology (pre-dialysis care), acute kidney injury, and renal 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 the European Renal Association-European Dialysis and Transplantation Association Registry.

## MATERIALS AND METHODS

In this manuscript, we provide a summary of the 2019 registry report.[1] More comprehensive and detailed data can be found in the booklet "Registry of the nephrology, dialysis, and transplantation in Turkey, Registry 2019" 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 renal replacement therapy centers; moreover, we extensively used a database

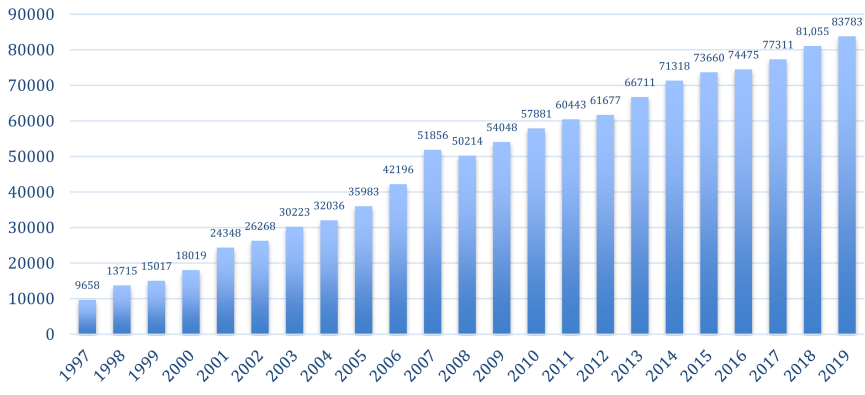


**Figure 1.** The number of patients receiving renal replacement therapy in Turkey by years.



under the supervision of the Ministry of Health to obtain complete data. This approach is used since 2012.

## RESULTS

### Incidence and Prevalence

By the end of the year 2019, there were a total of 83 783 patients who were on RRT. The number of patients on RRT continues to increase (Figure 1). The most common type of RRT is hemodialysis (73.2%), followed by transplantation (22.9%) and peritoneal dialysis (3.9%). Prevalence was calculated as 1007.6 per million population (pmp), and incidence was calculated as 150.5 pmp. Yearly changes in prevalence and incidence are shown in Figure 2.

### Hemodialysis

The number of patients on hemodialysis continues to increase, and, at the end of 2019, there were 61 341 (57.3% male) patients on hemodialysis. Although there is an increase in the absolute number of hemodialysis, patients' choice between hemodialysis and RRT is decreasing (81.7% in 2017, 73.2% in 2019). The age distribution of the patients is shown in Table 1. It should be noted that more than 50% of the hemodialysis population is composed of older patients. The number of incident hemodialysis patients is 9630. This data is similar to the data of the previous year (9645). In incident patients, the most common cause of kidney failure is diabetes mellitus (39.0%), followed by hypertension (24.2%), glomerulonephritis (5.7%), polycystic kidney disease (3.0%), and other causes. Primary etiology is unknown in 14.2% of the patients. The frequency of diabetes started to consolidate in the last 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 increases with age.

The initiation of hemodialysis was urgent in 31.5% and scheduled in 68.5% of the patients. The most common type of vascular access at the initiation of hemodialysis was permanent catheters in 44.7%, followed by arteriovenous fistulae in 35.9%, temporary catheters in 18.7%, and arteriovenous grafts in 0.6%.

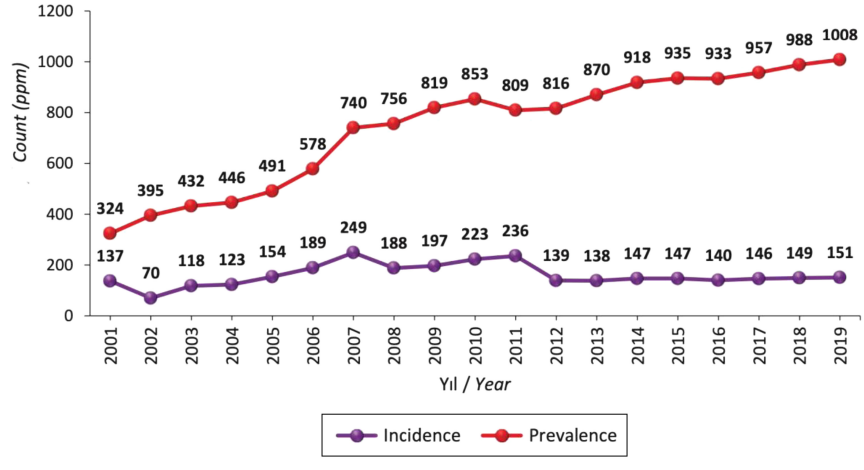


**Figure 2.** Prevalence and incidence of patients on renal replacement therapy by years. Since 2012, patient-based data provided by the Ministry of Health is used for the calculations.

**Table 1.** Age Distribution of Hemodialysis, Peritoneal Dialysis, and Transplantation Patients.

| Age | 0-19 | 20-44 | 45-64 | 65-74 | 75+ |
|---|---|---|---|---|---|
| Hemodialysis (%) | 0.6 | 11.6 | 37.2 | 29.3 | 21.4 |
| Peritoneal dialysis (%) | 11.9 | 22.4 | 42.6 | 17.7 | 5.6 |
| Transplantation (%) | 8.6 | 45.9 | 40.6 | 4.7 | 0.2 |

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

Longitudinal data regarding arteriovenous access is shown in Table 2. The arteriovenous fistula was the most common type of access (76.5%); however, the increasing use of catheters should be noted. The most common access site for temporary catheter placement was the internal jugular vein (55.6%), followed by femoral (32.6%) and subclavian (6.3%) vein. Subclavian catheterization is associated with venous thrombosis; therefore, the use of this vein is contraindicated in chronic kidney disease (CKD) patients.

Technical changes regarding hemodialysis treatment are shown in Table 2, and the increased use of high-flux membranes should be noted. The frequency of hemodialysis was 3 times/week in most of the patients (Table 2). In line with previous findings, a trend of increase in Kt/V values is observed (Table 2); as of the end of 2019, Kt/V is over 1.4 in most patients (75.3%).

A blood pressure target of <140/90 mmHg was achieved in 82.1% of hemodialysis patients, either with or without antihypertensive treatment. Yearly changes of various parameters regarding hemodialysis treatment are listed in Table 3. Decreasing hypoalbuminemia frequency was observed; as of the year 2019, albumin level was above 4.0 g/dL in 57.2%. Erythropoiesis stimulation agents were currently used in 53.5% of the patients, and 22.1% were previously used. Iron treatment was used by 60.6% of the patients. Drug treatment for secondary hyperparathyroidism was used by 63.9% (IV vitamin D 29.9%, vitamin D analogs 30.7%, calcimimetics 12.6%, oral vitamin D 10.2%, different combinations 16.7%). The most used phosphate binder agent was calcium acetate (40.9%), followed by sevelamer (26.0%), calcium carbonate (11.4%), and lanthanum (5.1%). Phosphate binders were not used by 16.2% of the patients.

Hepatitis B virus (HBV) surface antigen (HBsAg) was positive in 2.6% of the patients, and anti-hepatitis C virus (HCV) antibody was positive in 3.1% of the patients; double positivity was observed in 0.4% of the patients. Prevalence HCV has decreased. There were 67 patients with HIV positivity.

The distribution of patients regarding hemodialysis treatment duration is shown in Table 4; 35.5% of the patients were on hemodialysis treatment for more than 5 years. During the year 2019, a total of 9460 hemodialysis patients died. Cardiovascular diseases were the most common cause of death (46.4%), followed by cerebrovascular causes, infections, and malignancy.



**Peritoneal Dialysis**

As of the end of the year 2019, the total number of peritoneal dialysis patients was 3292, the decrease in the number of total peritoneal patients observed during the last decade stopped this year. Male patients were 46.7%, and the age distribution can be seen in Table 1. The total number of incident patients for the year 2019 was 1109. The most common cause of incident end-stage kidney failure was hypertension in 30.5% of the cases, followed by diabetes mellitus in 27.1%, glomerulonephritis in 11.8%, and polycystic kidney disease in 5.4%. The etiology was unknown in 10.8% of the cases. The frequency of hypertension was high; however, it is not possible to differentiate between primary and secondary hypertension due to renal disease.

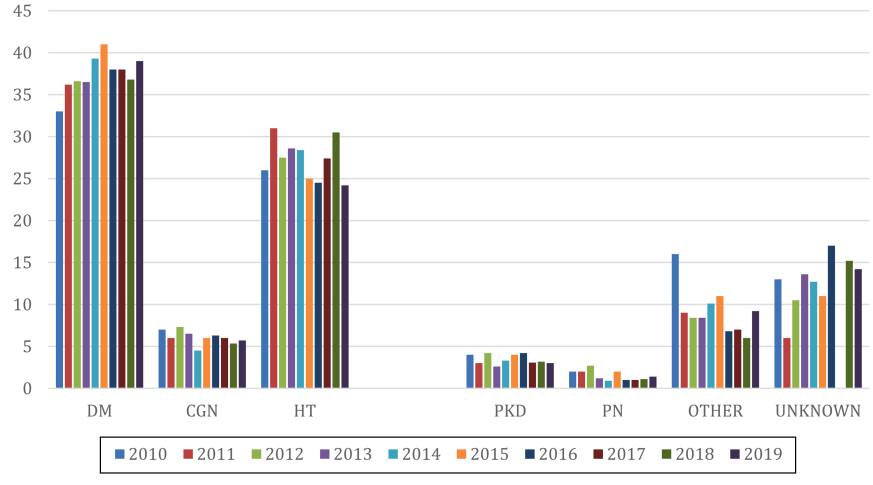


**Figure 3.** Primary etiology of kidney failure by years. DM, diabetes mellitus; CGI, chronic glomerulonephritis; HT, hypertension; PKD, polycystic kidney disease; PN, pyelonephritis.

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

| Years | 2006 | 2007 | 2008 | 2009 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vascular access | | | | | | | | | | | |
| AV fistulea | 85.7 | 86.0 | 85.4 | 84.0 | 82.9 | 81.1 | 80.4 | 79.1 | 78.7 | 77.4 | 76.5 |
| Permanent catheter | 6.9 | 7.0 | 7.7 | 9.3 | 11.7 | 13.4 | 14.4 | 15.6 | 18.0 | 19.1 | 20.3 |
| AV graft | 3.2 | 2.9 | 2.9 | 2.7 | 1.8 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 |
| Other | 4.2 | 4.1 | 4.0 | 4.0 | 3.6 | 3.9 | 3.8 | 3.9 | 2.1 | 2.3 | 2.1 |
| Dialyser type | | | | | | | | | | | |
| Synthetic | 62.8 | 67.2 | 60.3 | 65.0 | 58.9 | - | - | - | - | - | |
| Semi-synthetic | 22.1 | 19.1 | 17.6 | 14.0 | 7.0 | - | - | - | - | - | |
| High-flux | 15.0 | 13.7 | 21.8 | 21.0 | 34.1 | 33.3 | 36.3 | 45.6 | 46.2 | 46.3 | 47.6 |
| Kuprophan | 0.1 | 0.0 | 0.3 | 0.0 | 0 | - | - | - | - | - | |
| Dialysis frequency | | | | | | | | | | | |
| Once per week | 1.5 | 0.9 | 0.9 | 0.9 | 0.6 | 0.6 | 0.5 | 0.5 | 0.6 | 0.7 | 0.5 |
| Twice per week | 9.3 | 7.8 | 7.5 | 7.0 | 7.7 | 7.9 | 8.0 | 8.7 | 10.0 | 10.3 | 10.8 |
| Tree times per week | 89.2 | 89.9 | 90.2 | 90.1 | 90.1 | 90.8 | 90.7 | 89.7 | 88.3 | 88.0 | 87.8 |
| 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 |
| Kt/V value | | | | | | | | | | | |
| <1.20 | 14.5 | 12.7 | 11.3 | 10.2 | 11.0 | 11.3 | 9.8 | 8.3 | 8.4 | 7.4 | 7.0 |
| ≥1.20 | 85.5 | 87.3 | 88.8 | 89.8 | 89.0 | 88.7 | 90.2 | 91.7 | 91.6 | 92.6 | 92.9 |

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



Blood pressure was above the target limit of 140/90 mmHg in 23.7% 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 28.4% of the patients, and it was above 4 g/dL in 17.2% of the cases. During the last decade, hypoalbuminemia frequency was in the range of 25-30%. Erythropoiesis stimulating agents were currently used by 46.1% of the patients; 17.2% of them had previously used those agents. Iron treatment was used by 42.2% of the patients; most peritoneal dialysis patients had used iron via the oral route (77.0%). Drug treatment for secondary hyperparathyroidism was used by 64.1% of the patients. (Oral vitamin D by 50.8%,

**Table 3.** Hypoalbuminemia Rate and Treatment Characteristics in Dialysis Patients

| Year | 2006 | 2007 | 2008 | 2009 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hemodialysis | | | | | | | | | | | |
| Hypoalbuminemia (<3.5 g/dL) | 12.7 | 12.0 | 11.7 | 11.1 | 13.0 | 15.2 | 13.4 | 10.1 | 12.9 | 10.5 | 7.4 |
| ESA use (%) | 59.8 | 61.8 | 62.7 | 62.4 | 70.6 | 55.3 | 55.3 | 54.0 | 54.6 | 49.3 | 53.5 |
| Iron treatment (%) | 73.0 | 54.7 | 54.8 | 55.0 | 59.0 | 55.8 | 53.5 | 51.4 | 55.9 | 57.2 | 60.6 |
| Active vitamin D use* | 38.4 | 36.9 | 41.1 | 45 | 43.6 | 43.0 | 58.2 | 58.2 | 57.5 | 58.6 | 63.8 |
| Peritoneal dialysis | | | | | | | | | | | |
| Hypoalbuminemia (<3.5 g/dL) | 24.3 | 28.1 | 25.1 | 30.8 | 28.8 | 24.9 | 24.6 | 30.1 | 26.2 | 26.1 | 28.4 |
| ESA use (%) | 55.4 | 54.1 | 51.8 | 53.5 | 59.7 | 44.9 | 43.3 | 48.5 | 46.6 | 52.2 | 46.1 |
| Iron treatment (%) | 55.1 | 60.0 | 47.9 | 51.0 | 52.1 | 47.7 | 55.3 | 43.6 | 44.0 | 50.4 | 42.2 |
| Active D use* | 41.4 | 37.6 | 37.6 | 56.8 | 55.9 | 59.1 | 67.5 | 68.3 | 66.2 | 68.7 | 64.1 |

*Following 2015, use of drugs for the treatment of secondary hyperparathyroidism.

**Table 4.** Duration of Renal Replacement Therapy

| Time (years) | <1 | 0-5 | 6-10 | 11-15 | 16-20 | >20 |
|---|---|---|---|---|---|---|
| Hemodialysis (%) | 15.7 | 48.8 | 21.7 | 8.5 | 3.3 | 2.0 |
| Peritoneal dialysis (%) | 26.4 | 44.1 | 21.2 | 6.6 | 1.6 | 0.2 |

calcimimetics by 7.4%, vitamin D analogs by 31.6%, and intravenous vitamin D 0.6%.) The most used phosphate binders were calcium acetate (36.8%), followed by calcium carbonate (22.2%) and sevelamer (20.7%).

Obesity (8.5%) was the common complication excluding peritonitis; it was followed by hernia (4.5%), drainage problems (3.7%), inadequate dialysis (3.0%), dialysate leakage (2.8%), and ultrafiltration failure (2.7%).

HBsAg positivity was present in 1.6%, and anti-HCV positivity was present in 1.1%. Both HBV and HCV prevalence have decreased. There was no HIV-positive patient.

The patients' distribution regarding the duration of peritoneal dialysis is seen in Table 4. In this study, 30.0% of the patients were on peritoneal dialysis for more than 5 years. The most common cause of death was cardiovascular disease (52.4%), followed by infection (17.1%) and cerebrovascular disease (14.6%).

**Transplantation**

Kidney transplantation performed in Turkey over the years is gradually increasing. According to the data provided by the Ministry of Health during the year 2019, 3858 kidney transplantations were performed on 3842 patients, 1and 6 patients had kidney transplantation more than one time during 2019. Recipients were generally male (64.5%). 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 (79.1%). First-degree relatives were the most common source of living donors (35.5%), followed by spouses (21.9%). The incidence of non-related donors was 9.3%.

Longitudinal data regarding living donor types is shown in Figure 4. The rate of cadaveric transplantation was 20.6%, and longitudinal data regarding donor type is shown in Figure 5. The most common cause of renal failure was diabetes mellitus (20.9%), followed by glomerulonephritis (20.4%), hypertension (18.5%), and polycystic kidney disease (6.0%). Primary etiology is not known in 16.5% of the cases. It should be noted that hypertension might be secondary, at least in some cases. The previous renal replacement therapy type was hemodialysis in 50.2% of the patients and peritoneal dialysis in 3.6%. The high rate (46.2%) of pre-emptive transplantation should be noted.

The prognosis of new transplantations was evaluated according to the data of 3858 operations. A total of 165 deaths were reported in new transplantations in the same year, with a mortality rate of 2.9% for live donors and 9.7% for cadaveric donors. Besides, when evaluating these figures, it should be kept in mind that the number of live donors in Turkey is high. Death occurs mainly due to infection (46.1%) and cardiovascular (26.1%) causes.

**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, such as data collection method, center features, and data set properties.

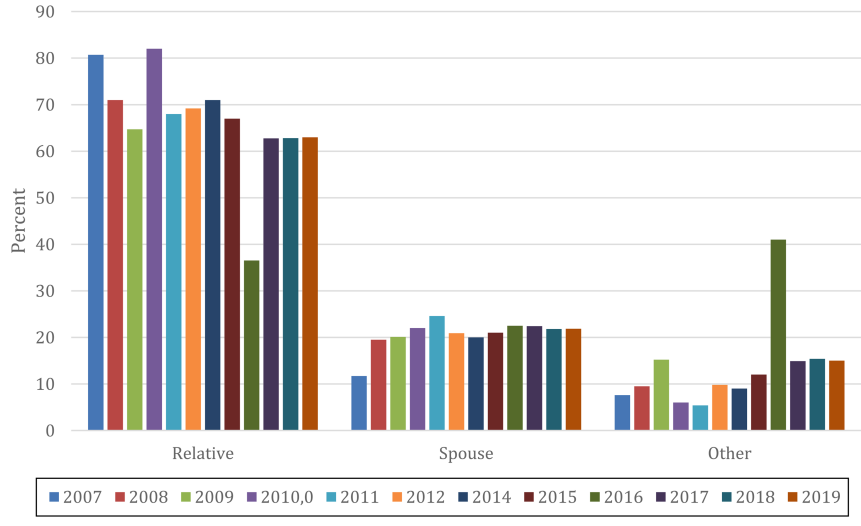


**Figure 4.** Relationship of the living donor with the recipient.

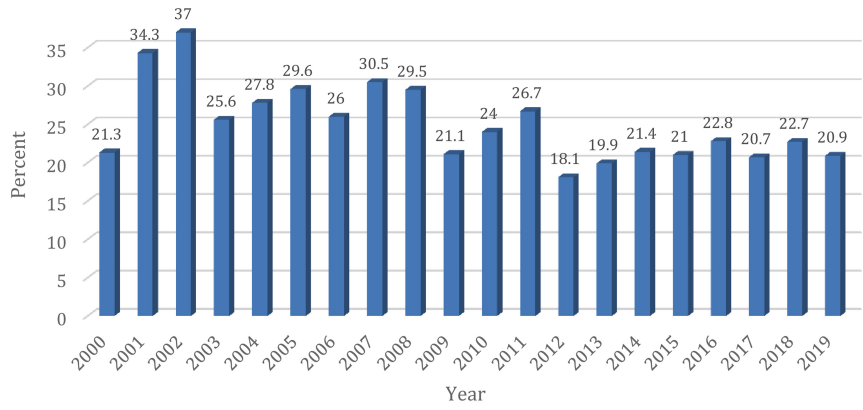


**Figure 5.** Cadaveric kidney transplantation rate by years.



A clear trend of the increase was seen in the number of prevalent RRT patients. However, the rate of growth in prevalence started to decrease in the last years. The trend in the number of incident patients is not as clear. Specifically, there is a remarkable reduction in incidence in the year 2012. Since this year (2012), incidence and prevalence calculations were done using patient-based data collected by the Ministry of Health. In previous years, center-based data collected by the Turkish Society of Nephrology was used. We suggested that changes in data collection methods in the past 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 a population-based survey of Chronic Renal Disease In Turkey—the CREDIT study (CREDIT) and The Turkish Diabetes Epidemiology Study (TURDEP) have shown that the rate of diabetes mellitus has increased approximately 2-fold in our country in the last 10 years.[2,3] The rate of diabetes is around 40% in incident hemodialysis patients. These data show that diabetes mellitus and diabetic nephropathy have become the first item of the nephrology agenda. 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 RRT; significant qualitative improvements in this treatment continue.

There was a clear trend of a decrease in the number of patients undergoing peritoneal dialysis from 2006 until this year. This trend may be due to the lack of new patient recruitment and the increase in pre-emptive transplantation activity. The increase that we observed this year should be monitored before declaring the end of this decade-long decreasing trend.

The incidence of transplantation is similar to the previous year. In terms of the number of living transplantations, Turkey has reached the top rankings globally, according to many metrics. Choosing the appropriate live donor is very important. The pre-emptive transplantation rate, which was 43.9% last year, increased to 46.2% this year. This high rate is remarkable and raises some concerns about the timing of the transplantation. In 2019, 9.3% of living donor transplantations were made from unrelated donors. Ethical compliance of those cases should be carefully monitored.

Despite the increase in transplantation, the lack of desired increase in the rate of cadaveric kidney transplantation is a continuing problem of organ donation. Besides, in cadaveric donor transplantations especially, mortality and graft loss rates are seen as a significant problem in the first year and should be closely monitored.

To increase renal transplantation, which is the best 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 patients' health and the national economy. The state can provide various benefits to the family of cadaveric donors.

Registry data provide information about patients receiving RRT 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. CREDIT study revealed that CKD is a significant public health problem for our country.[2]

The quality of RRT 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 end stage renal disease (ESRD) 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 diagnose CKD quite early, slow CKD progression, and treat CKD.

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## REFERENCES

1. *Türkiye'de, Nefroloji-Diyaliz ve Transplantasyon: Registry 2019*. Ankara: Türk Nefroloji Derneği Yayınları; Miki Matbaacılık San. ve Tic. Ltd. Şti.; 2020.
2. Süleymanlar G, Utaş C, Arinsoy T, et al. A population-based survey of chronic renal disease in Turkey – the CREDIT study. *Nephrol Dial Transplant*. 2011;26(6):1862-1871. [CrossRef]
3. Satman I, Omer B, Tutuncu Y, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *Eur J Epidemiol*. 2013;28(2):169-180. [CrossRef]