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Original Article

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Current Status of Renal Replacement Therapy in Turkey: A Summary of 2020 Turkish Society of Nephrology Registry Report

Nurhan Seyahi[1], İsmail Koçyiğit[2], Kenan Ateş[3], Gültekin Süleymanlar[4]

[1]Department of Nephrology, İstanbul University-Cerrahpaşa, Cerrahpaşa School of Medicine, İstanbul, Turkey
[2]Department of Pediatric Nephrology, Erciyes University School of Medicine, Kayseri, Turkey
[3]Department of Nephrology, Ankara University School of Medicine, Ankara, Turkey
[4]Department of Nephrology, Akdeniz University School of Medicine, Antalya, Turkey

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 31st year of registry reports. The registry is in close collaboration with international registries.
Methods: In this paper, we summarized data from the 2020 registry report; additionally, we also provided yearly trends of managing end-stage kidney disease.
Results: The number of patients on renal replacement therapy decreases; at the end of 2020, 83 350 patients were on renal replacement therapy. The prevalence and incidence of end-stage renal disease were 996.8 and 138.7 per million population, respectively. Diabetes was the most common cause of end-stage renal disease. Hemodialysis (72.7%) was the most common type of treatment modality, followed by transplantation (23.3%) and peritoneal dialysis (4.06%).
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, kidney transplantation, registry

Corresponding author: Nurhan Seyahi ✉ nseyahi@yahoo.com
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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 the 31st 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 renal replacement therapies (RRT), including hemodialysis (HD), 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 European Renal Association-European Dialysis and Transplantation Association registry.

In 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. Accordingly, registry data show several significant changes in RRT-related data in 2020, probably reflecting the effect of the pandemic in our patient population.

METHODS

In this manuscript, we provide a summary of the 2020 registry report.[1] More comprehensive and detailed data can be found in the booklet "Registry of the nephrology, dialysis, and transplantation in Turkey, Registry 2020" published by Turkish Society of Nephrology. Current and previous reports can be accessed from the

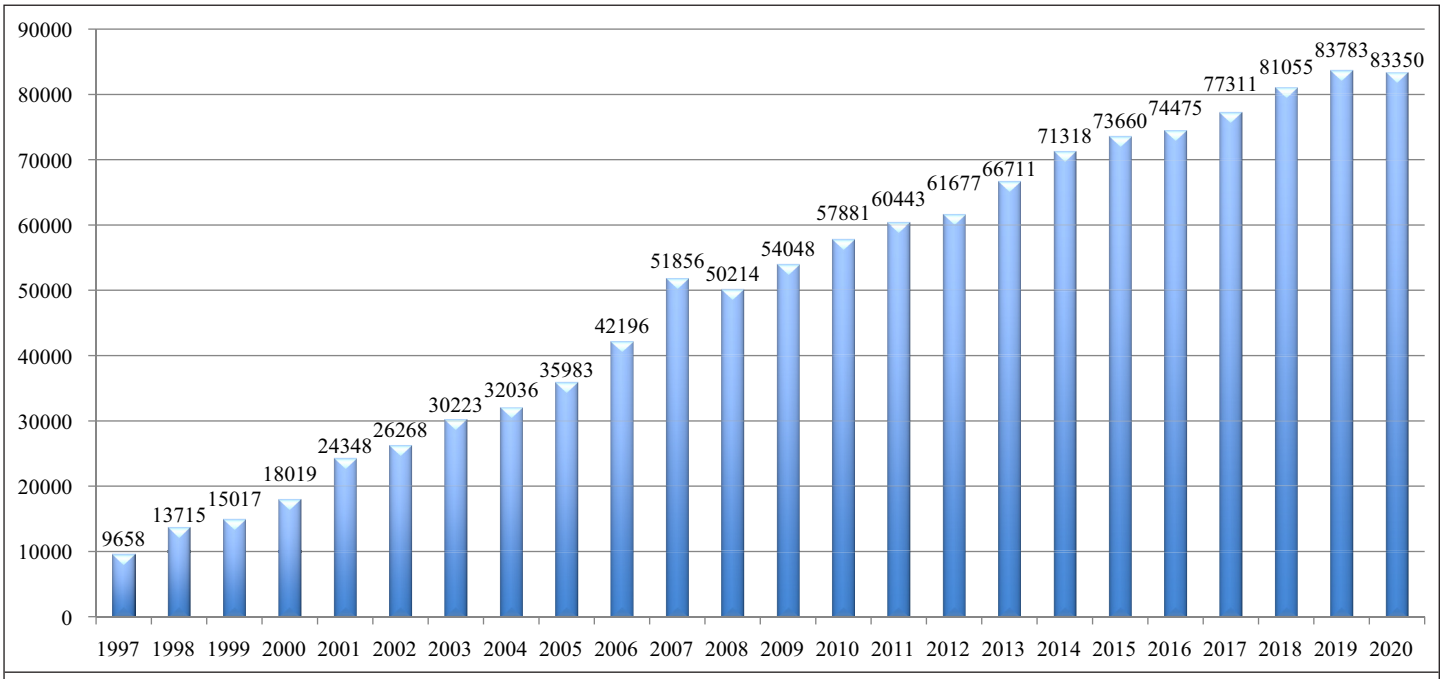

Figure 1. Number of patients receiving renal replacement therapy in Turkey by years.

website of Turkish Society of Nephrology (www.tsn.org.tr or www.nefroloji.org.tr).

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

RESULTS

Incidence and Prevalence

At the end of 2020, there were a total of 83 750 patients who were on RRT. The number of patients on RRT decreased during 2020 for the first time since 2008 (Figure 1). The most common type of RRT is HD (72.6%), followed by transplantation (23.2%) and peritoneal dialysis (4.1%). Prevalence was calculated as 996.8 per million population (pmp), and incidence was calculated as 138.7 pmp. Yearly changes in prevalence and incidence are shown in Figure 2. Although the prevalence was in a long-term and stable increasing trend, a decrease in prevalence was noted in 2020.

Hemodialysis

At the end of 2020, there were 60 558 (57.6% male) patients on HD. We noted a decrease in the absolute number of HD patients in this year and the share of HD between RRT is decreasing (81.7% in 2017, 72.6% in 2020). The age distribution of the patients is shown in Table 1. It should be noted that more than 50% of the HD population is composed of old patients. The number of incident HD patients is 9081. There is a decrease in incident HD patients also (9630). In incident patients, the most common cause of kidney failure is diabetes mellitus (36.7%), followed by hypertension (27.5%), glomerulonephritis (5.9%), polycystic kidney disease (3.9%), and other causes. Primary etiology is unknown in 14.7% 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 is increasing with age.

The initiation of HD was urgent in 30.4% and scheduled in 69.6% of the patients. The most common type of vascular access at the initiation of HD was permanent catheters in 47.3%, followed by arteriovenous fistula in 31.2%, temporary catheters in 21.4%, and arteriovenous grafts in 0.3%. Longitudinal data regarding arteriovenous access are shown in Table 2. The arteriovenous fistula was the most common type of access in prevalent patients (74.7%); however, the increasing use of catheters should be noted. The most common access site for temporary catheter placement was the internal jugular vein (70.2%), followed by femoral (16.1%) and subclavian (9.9%) vein.

MAIN POINTS

- This is the 31st yearly registry report.
- Coronavirus disease 2019 has had a negative impact on the morbidity and mortality of patients undergoing RRT.
- We noted a decrease in the number of total hemodialysis patients for the first time since 2011.
- Following a decade long decrease trend, number of peritoneal dialysis patients increased for the second consecutive year.
- There was a striking decrease in the number of kidney transplantations. Especially the rate of cadaveric transplantation decreased very significantly.

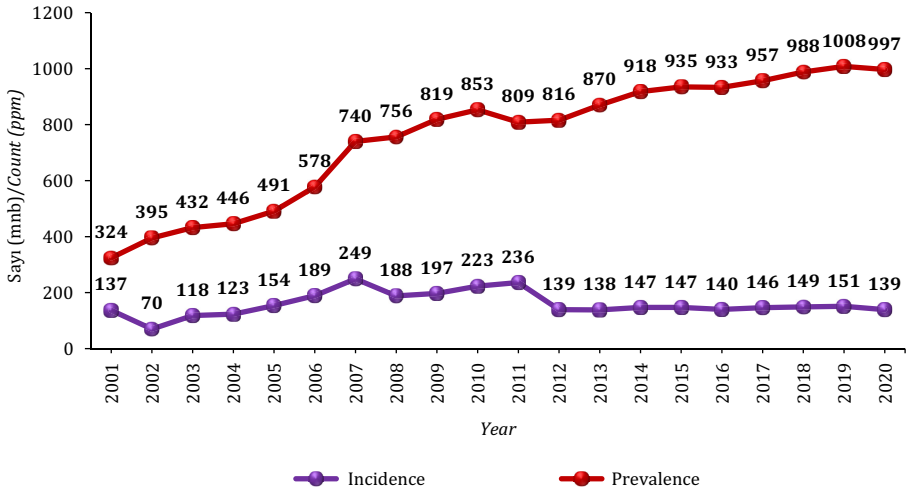

Figure 2. Prevalence and incidence of patients on renal replacement therapy by years. Since 2012, patient-based data provided by the Ministry of Health are used for the calculations.

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

Age	0-19	20-44	45-64	65-74	75+
Hemodialysis (%)	0.7	12.5	37.7	28.9	20.1
Peritoneal dialysis (%)	14.4	24.2	39.7	17.7	4.1
Transplantation (%)	9.4	50.2	36.1	4.2	0.2

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

Subclavian catheterization is associated with venous thrombosis; therefore, the use of this vein is contraindicated in chronic kidney disease (CKD) patients.

Technical changes regarding HD treatment are shown in Table 2, increased use of high-flux membranes should be noted. The frequency of HD was 3 times/week in most of the patients (Table 2). A decrease in Kt/v value is observed this year in contrast to the previous trend of increase in Kt/V values (Table 2); as of the end of 2020, Kt/V is over 1.4 in 69.6 of the patients.

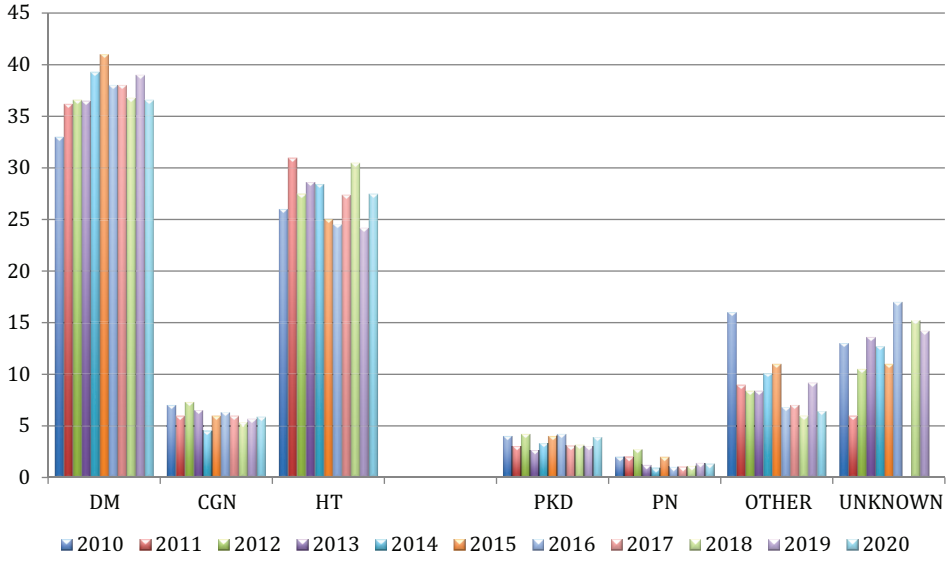

Figure 3. Primary etiology of kidney failure by years. DM, Diabetes mellitus; CGI, chronic glomerulonephritis; HT, hypertension; PKD, polycystic kidney disease; PN, Pyelonephritis.

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	2020
Vascular access												
AV fistula	85.7	86.0	85.4	84.0	82.9	81.1	80.4	79.1	78.7	77.4	76.5	74.7
Permanent catheter	6.9	7.0	7.7	9.3	11.7	13.4	14.4	15.6	18.0	19.1	20.3	21.6
AV graft	3.2	2.9	2.9	2.7	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.0
Other	4.2	4.1	4.0	4.0	3.6	3.9	3.8	3.9	2.1	2.3	2.1	2.7
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	76.1
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	0.6
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	11.4
Three 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	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
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	13.4
≥1.20	85.5	87.3	88.8	89.8	89.0	88.7	90.2	91.7	91.6	92.6	92.9	86,6

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

A blood pressure target of <140/90 mm Hg was achieved in 80.7% of HD patients, either with or without antihypertensive treatment. Yearly changes of various parameters regarding HD treatment are listed in Table 3. An increase in hypoalbuminemia frequency was observed; as of the year 2020, the albumin level was above 4.0 g/dL in 59.4%. Erythropoiesis stimulation

Table 3. Hypoalbuminemia Rate and Treatment Characteristics in Dialysis Patients

Year	2006	2007	2008	2009	2013	2014	2015	2016	2017	2018	2019	2020
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	13.8
Erythropoiesis-Stimulating Agents (ESA) use (%)	59.8	61.8	62.7	62.4	70.6	55.3	55.3	54.0	54.6	49.3	53.5	59.2
Iron treatment (%)	73.0	54.7	54.8	55.0	59.0	55.8	53.5	51.4	55.9	57.2	60.6	63.0
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	61.1
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	22.8
ESA use (%)	55.4	54.1	51.8	53.5	59.7	44.9	43.3	48.5	46.6	52.2	46.1	48.5
Iron treatment (%)	55.1	60.0	47.9	51.0	52.1	47.7	55.3	43.6	44.0	50.4	42.2	43.9
Active vitamin D use*	41.4	37.6	37.6	56.8	55.9	59.1	67.5	68.3	66.2	68.7	64.1	60.8

*Following 2015; this data reflects the 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 (%)	12.9	49.9	22.6	8.8	3.5	2.3
Peritoneal dialysis (%)	27.0	42.9	17.1	7.7	5.1	0.2

agents were currently used in 59.2% of the patients, and 21.8% were previously used. Iron treatment was used by 63.0% of the patients. Drug treatment for secondary hyperparathyroidism was used by 61.1% (intravenous (IV) vitamin D 29.4%, vitamin D analogs 30.2%, calcimimetics 11.4%, oral vitamin D 9.2%, different combinations 19.9%). The most used phosphate binder agent was calcium acetate (39.9%), followed by sevelamer (25.7%), calcium carbonate (12.1%), and lanthanum (3.5%). Phosphate binders were not used by 15.4% of the patients.

Hepatitis B virus surface antigen (HBsAg) was positive in 2.4% of the patients, and anti-hepatitis C virus (HCV) antibody was positive in 2.7% of the patients, double positivity was observed in 0.1% of the patients. The prevalence of HCV is decreasing. There were 37 patients with HIV positivity.

The distribution of patients regarding HD treatment duration is shown in Table 4; 37.2% of the patients were on HD treatment for more than 5 years. In all, cardiovascular diseases were the most common cause of death (42.55%), followed by infections, cerebrovascular causes, and malignancy.

Peritoneal Dialysis

As of the end of 2020, the total number of peritoneal dialysis patients was 3387, similar to 2019 a slight increase in the number of peritoneal dialysis was observed following a decade-long decrease trend. Male patients were 48.27% of the cases, the age distribution can be seen in Table 1. The total number of incident patients for 2020 was 1175. The most common cause of incident end-stage kidney failure was diabetes mellitus in 25.0% of the cases, followed by hypertension in 22.0%, glomerulonephritis in 9.3%, and polycystic kidney disease in 3.0%. The etiology was unknown in 27.2% 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.

Blood pressure was above the target limit of 140/90 mm Hg in 27.6% 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 22.8% of patients, and it was above 4 g/dL in 17.3% of the cases. During the last decade, hypoalbuminemia frequency was in the range of 25-30%. Erythropoiesis stimulating agents were currently used by 48.5% of the patients; 17.1% of them had previously used those agents. Iron treatment was used by 43.9% of the patients; most peritoneal dialysis patients had used iron using the oral route (80.0%). Drug treatment for secondary hyperparathyroidism was used by 61.1% (IV vitamin D 29.4%, vitamin D analogs 30.2%, calcimimetics 11.4%, oral vitamin D 9.2%, different combinations 19.9%). The most used phosphate binders were calcium acetate (29.2%), followed by calcium carbonate (25.1%) and sevelamer (18.2%).

Hernia (6.25%) was the common complication excluding peritonitis; it is followed by obesity (4.2%), inadequate dialysis (3.2%), dialysate leakage (2.3%), and ultrafiltration failure (2.3%).

HBsAg positivity was present in 1.9%, and anti-HCV positivity was present in 1.0%. There was no HIV-positive patient.

The patients' distribution regarding the duration of peritoneal dialysis is seen in Table 4. In total, 30.0% of the patients were on peritoneal dialysis for more than 5 years. The most common cause of death was cardiovascular disease (42.9%), followed by infection (17.9%) and cerebrovascular disease (12.5%).

Transplantation

Kidney transplantation performed in Turkey over the years is gradually increasing until 2020. According to the data provided by the Ministry of Health during 2020, 2499 kidney transplantations were performed. Compared to the previous year, this corresponds to a decrease of 35.0%. Recipients were generally male (65.8%). 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 (90.0%). First-degree relatives were the most common source of living donors (34.0%), followed by spouses (22.0%). The incidence of non-related donors was 9.2%.

Longitudinal data regarding living donor types are shown in Figure 4. The rate of cadaveric transplantation was 10.0%, longitudinal data regarding donor type are shown in Figure 5. The most common cause of renal failure was glomerulonephritis (19.2%), followed by diabetes mellitus (18.9%), hypertension (16.9%), and polycystic kidney disease (6.3%). Primary etiology is not known in 20.1% of the cases. It should be noted that hypertension might be secondary, at least in some cases. The previous RRT type was HD in 34.7% of the patients and peritoneal dialysis in 3.6%. The high rate (53.6%) of pre-emptive transplantation should be noted.

The prognosis of the new transplantations was evaluated according to the data of 2499 transplantations. A total of 150 deaths were reported in the new transplantations in the same year, with a mortality rate of 5.1% for live donors and 14.5% for cadaveric donors. Besides, when evaluating these figures, it should be kept in mind that the number of live donors in our country is high.

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

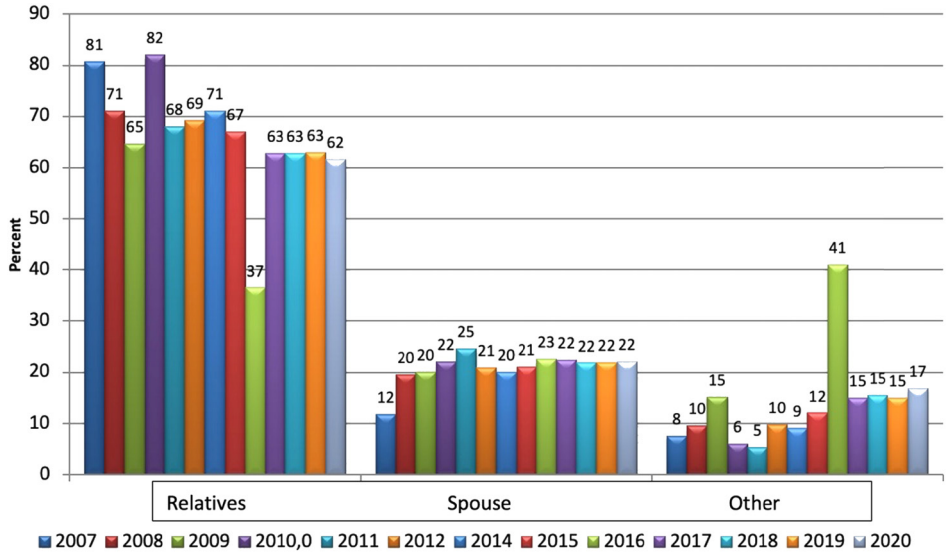

Figure 4. Relationship of the living donor with the recipient.

Figure 5. Cadaveric kidney transplantation rate by years.

with actual change: data collection method, center features, and data set properties. However, 2020 was a special year because of the COVID-19 pandemic and important changes are observed in many aspects of RRT. The first COVID-19 case in our country was officially declared on March 11, 2020. The COVID-19 pandemic has also been very active in our country throughout 2020. Coronavirus disease 2019 has had a negative impact on the morbidity and mortality of patients undergoing RRT.

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 and a decrease in prevalence was noted in 2020. 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 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 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 diabetes mellitus has increased approximately 2-fold in our country in the last 10 years.[2,3] The rate of

diabetes is around 35% in incident HD 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 nondiabetic patients due to widespread and severe vascular disease. Hemodialysis is the most common form of RRT; 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 possible interaction of the pandemic might be considered. The number of home HD patients has increased to 895, and it is noteworthy that there is a significant increase compared to the previous year (678). Due to the pandemic, home dialysis options may have been preferred more. The number of patients with acceptable Kt/V as well as the number of patients with low albumin levels decreased.

There was a clear trend of a decrease in peritoneal dialysis patients number from 2006 until 2019. In the formation of this trend, especially the lack of new patient recruitment and the increase in preemptive transplantation activity seem to be causative. Following a decade-long decreasing trend, we observed an increase in the number of peritoneal dialysis patients in the last 2 consecutive years. However, this year, peritoneal dialysis might be preferred because of the pandemic, additionally, renal transplantation activity was significantly decreased because of the pandemic, and this might be an additional factor for the increase of peritoneal dialysis because patients from peritoneal dialysis were appropriate candidates for transplantation. The increase that we observed in the last 2 years should be monitored before declaring the end of this decade-long decrease trend.

Many different parameters suggest that COVID-19 has a serious 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 cadaver donor is 10%. This rate shows that there is a serious decrease in cadaveric transplantation activity, which is generally in the 18-25% band and is already low. The main reason for this decline is the multiple effects of the COVID-19 pandemic on the health system. The rate of pre-emptive transplantation is even higher this year compared to that of the last year (46.1% vs. 53.6%). Those high numbers raise some concerns about the correct timing of transplantation.

In terms of the number of living transplantation, Turkey has reached the top rankings globally, according to many metrics. Choosing the appropriate live donor is very important. In 2020, 9.24% of living donor transplantation was made from unrelated donors. Ethical compliance of those cases should be carefully monitored.

The low rate of cadaveric kidney transplantation is a continuing problem of organ donation. Besides, especially in cadaveric donor transplantations, 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 university, ministry of health, and community is essential for our patients' health and the national economy. The state can provide various advantages 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, Ministry of Health initiated the national kidney disease prevention program. This program aims to prevent CKD by early diagnosis, slow progression, and treatment.

Ethics Committee Approval: The article summarizes data from the 2020 registry report.

Informed Consent: N/A.

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Declaration of Interests: The authors declare that they have no competing interest.

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