10.5152/turkjnephrol.2020.4249

Original Article

Turkish Journal of Nephrology

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

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

[1]Division of Nephrology, Department of Internal Medicine, İstanbul University-Cerrahpaşa, Cerrahpaşa School of Medicine, İstanbul, Turkey
[2]Division of Nephrology, Department of Internal Medicine, Ankara University School of Medicine, Ankara, Turkey
[3]Division of Nephrology, Department of Internal Medicine, Akdeniz University School of Medicine, Antalya, Turkey

Abstract

Objective: Every year, the registry of the Turkish Society of Nephrology conducts data collection on hemodialysis, peritoneal dialysis, and transplantation. Registry reports are printed annually as a booklet, thus making 2019 the 29th year of registry reports. The registry is in close collaboration with international registries.
Materials and Methods: This paper summarizes the data from the 2018 registry report. Additionally, this paper provides the yearly trends in the management of end-stage renal disease.
Results: There is an alarming increase in the number of patients undergoing renal replacement therapy (RRT). At the end of 2018, 81,055 patients had undergone RRT. The prevalence and incidence of end-stage renal disease were 988 and 149 per million populations, respectively. Diabetes was termed as the most widespread cause of end-stage renal disease. Hemodialysis (74.8%) serves as the most common type of treatment modality, followed by transplantation (21.2%) and peritoneal dialysis (3.9%).
Conclusion: End-stage renal disease is a critical and growing health concern in our country. The Turkish Renal Registry of the Turkish Society of Nephrology continues to be one of the leading tools for providing the current and sound data on this public health problem.
Keywords: Kidney failure, renal replacement therapy, hemodialysis, peritoneal dialysis, renal transplantation, registry

Corresponding Author: Nurhan Seyahi ✉ nseyahi@yahoo.com
Received: 25.12.2019 **Accepted:** 25.12.2019

Cite this article as: Seyahi N, Ateş K, Süleymanlar G. Current Status of Renal Replacement Therapy in Turkey: A Summary of the Turkish Society of Nephrology Registry Report. Turk J Nephrol 2020; 29(1): 6-11.

INTRODUCTION

In 1990, Professor Ekrem Erek founded the registry of the Turkish Society of Nephrology (Turkish Renal Registry), and 2019 marks its 29th anniversary. Since its inception, paper forms were employed to collect center-based data. However, the data were collected using electronic forms accessed via the internet since 2007. Every year, data regarding renal replacement therapies (RRT), such as hemodialysis, peritoneal dialysis, and transplantation, are collected. Moreover, in selected years, data on specialized topics, such as clinical nephrology (predialysis care), acute kidney injury, and renal pathology, are collected. Data from the Turkish Renal Registry are published and shared with the United States Renal Data System and European Renal Association-European Dialysis and Transplantation Association registry.

This manuscript provides a summary of the 2018 registry report (1). The booklet "Registry of the nephrology, dialysis, and transplantation in Turkey, Registry 2018" published by the Turkish Society of Nephrology provides more comprehensive and detailed data. The website of the Turkish Society of Nephrology (www.tsn.org.tr or www.nefroloji.org.tr) provides complete access to current and previous reports.

Data were collected from the selected RRT centers; moreover, a database of the Ministry of Health was extensively used to obtain the complete data. This approach has been used since 2012.

Incidence and Prevalence

A total of 81,055 patients had undergone RRT till the end of year 2018. The number of patients on RRT continues to

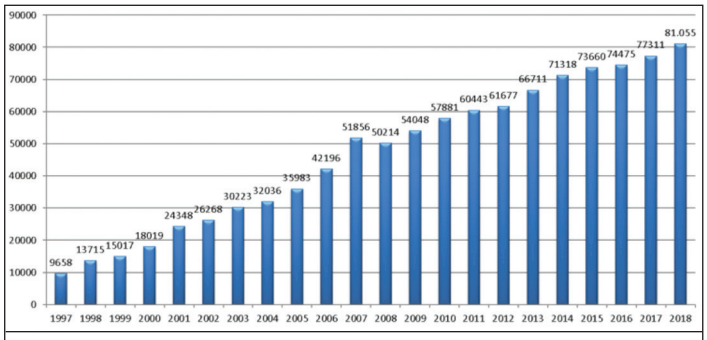

Figure 1. Number of patients receiving renal replacement therapy in Turkey by years.

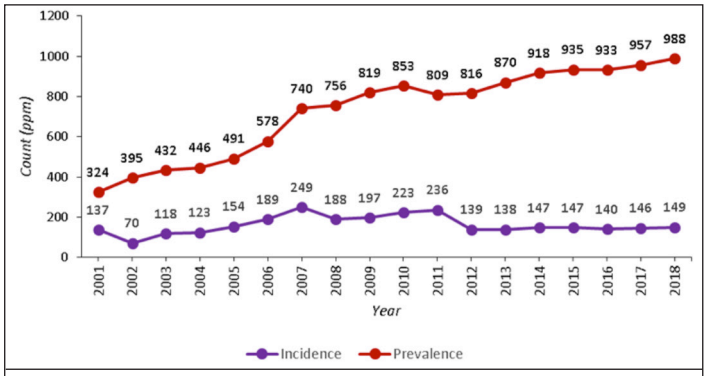

Figure 2. Prevalence and incidence of patients on renal replacement therapy by years. The incidence number for 2002 was corrected to 70. Since 2012, patient-based data provided by the Ministry of Health is used for the calculations.

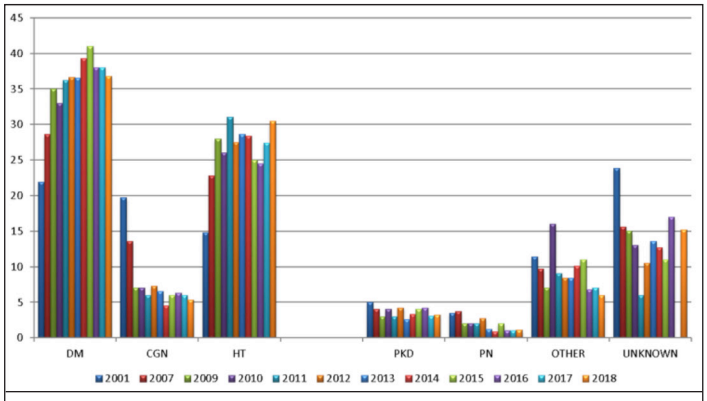

Figure 3. Primary etiology of kidney failure by years.
DM: Diabetes mellitus; CGI: Chronic glomerulonephritis; HT: Hypertension; PKD: Polycystic kidney disease; PN: Pyelonephritis.

increase at an alarming rate (Figure 1). The most common type of RRT is hemodialysis (74.8%), followed by transplantation (21.2%) and peritoneal dialysis (3.9%). The prevalence and incidence of end-stage renal disease were 988 and 149 per million populations, respectively. Yearly changes in prevalence and incidence are presented in Figure 2. During the data checks, the incidence data of 2002 was corrected: incidence was updated as 70 instead of 93.

Hemodialysis

The number of patients on hemodialysis continues to increase at a worrying rate. There were 60,643 (57.1% male) patients on hemodialysis at the end of 2018. The age distribution of the patients is presented in Table 1. It should be noted that >45% of the population on hemodialysis comprises old patients. The number of incident patients on hemodialysis was 9645. The most common cause of kidney failure was diabetes mellitus (36.8%) followed by hypertension (30.5%), glomerulonephritis (5.34%), polycystic kidney disease (3.2%), and other causes 9.0%in these patients. The primary etiology was unknown in 15.2% of the patients. The frequency of diabetes started to consolidate in the last few years (Figure 3). It is not possible to clarify whether the high rate of hypertension is the primary or secondary reason due to an underlying kidney disease. The incidence of diabetes increased with age.

Table 1. Age distribution of patients undertaking hemodialysis, peritoneal dialysis, and transplantation

Age	0-19	20-44	45-64	65-74	75+
Hemodialysis (%)	0.7	12.5	40.7	28	18.2
Peritoneal dialysis (%)	12.2	22.8	42.3	16.5	6.2
Transplantation (%)	8.6	45.0	42.6	3.7	0.2

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

The initiation of hemodialysis was urgent in 57.5% and scheduled in 42.5% of the patients. The most common type of vascular access at the initiation of hemodialysis was permanent catheters in 42.5%, followed by arteriovenous fistulae in 38%, temporary catheters in 19%, and arteriovenous grafts in 0.5%. Longitudinal data regarding arteriovenous access is shown in Table 2. Arteriovenous fistula was the most common type of access (77.4%); however, a trend of increasing use of catheters should be noted. The most common access site for temporary catheter placement was the internal jugular vein (66.5%), followed by the femoral vein (27.8%) and subclavian (4.1%) vein. Subclavian catheterization is associated with venous thrombosis; therefore, the use of this vein is contraindicated in patients with chronic kidney disease (CKD).

Technical changes regarding hemodialysis treatment are presented in Table 2. The increased use of high-flux membranes should be noted. The frequency of hemodialysis was three times a week in most of the patients (Table 2). In line with the previous findings, an increasing trend in the Kt/V values is observed (Table 2). As of the end of 2018, the Kt/V value was >1.4 in most of the patients (74.0%).

A blood pressure target of <140/90 mmHg was achieved in 79.4% of patients on hemodialysis with or without antihypertensive treatment. Yearly changes of several parameters with respect to hemodialysis treatment are listed in Table 3. The decreasing frequency of hypoalbuminemia was observed until 2016. As of 2018, the albumin level was >4.0 g/dL in 47.2% patients. In total, 49.3% of the patients were current users of erythropoiesis-stim-

Table 2. Variation of the technical characteristics of hemodialysis treatment over the years (data represent percentage of patients) *

Years	2005	2006	2007	2008	2009	2013	2014	2015	2016	2017	2018
Vascular access											
AV fistulae	88.7	85.7	86.0	85.4	84.0	82.9	81.1	80.4	79.1	78.7	77.4
Permanent catheter	3.6	6.9	7.0	7.7	9.3	11.7	13.4	14.4	15.6	18.0	19.1
AV graft	2.7	3.2	2.9	2.9	2.7	1.8	1.6	1.5	1.4	1.3	1.2
Other	5.0	4.2	4.1	4.0	4.0	3.6	3.9	3.8	3.9	2.1	2.3
Dialyzer type											
Synthetic	43.0	62.8	67.2	60.3	65.0	58.9	-	-	-	-	-
Semi-synthetic	47.8	22.1	19.1	17.6	14.0	7.0	-	-	-	-	-
High-flux	9.0	15.0	13.7	21.8	21.0	34.1	33.3	36.3	45.6	46.2	46.3
Kuprophan	0.2	0.1	0.0	0.3	0.0	0	-	-	-	-	-
Dialysis frequency											
Once per week	1.7	1.5	0.9	0.9	0.9	0.6	0.6	0.5	0.5	0.6	0.7
Twice per week	10.2	9.3	7.8	7.5	7.0	7.7	7.9	8.0	8.7	10.0	10.3
Tree times per week	88.1	89.2	89.9	90.2	90.1	90.1	90.8	90.7	89.7	88.3	88.0
More than three times per week or night HD	-	-	1.4	1.4	2.0	0.7	0.8	0.8	1.1	1.1	1.0
Kt/V value											
<1,20	27.8	14.5	12.7	11.3	10.2	11.0	11.3	9.8	8.3	8.4	7.4
≥1,20	72.2	85.5	87.3	88.8	89.8	89.0	88.7	90.2	91.7	91.6	92.6

* 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 patients on dialysis

Year	2005	2006	2007	2008	2009	2013	2014	2015	2016	2017	2018
Hemodialysis											
Hypoalbuminemia (<3.5 gr/dL)	13.5	12.7	12.0	11.7	11.1	13.0	15.2	13.4	10.1	12.9	10.5
ESA use (%)	60.4	59.8	61.8	62.7	62.4	70.6	55.3	55.3	54.0	54.6	49.3
Iron treatment (%)	57.2	73.0	54.7	54.8	55.0	59.0	55.8	53.5	51.4	55.9	57.2
Active vitamin D use*	42.3	38.4	36.9	41.1	45	43.6	43.0	58.2	58.2	57.5	58.6
Peritoneal dialysis											
Hypoalbuminemia (<3.5 gr/dL)	30.6	24.3	28.1	25.1	30.8	28.8	24.9	24.6	30.1	26.2	26.1
ESA use (%)	52.7	55.4	54.1	51.8	53.5	59.7	44.9	43.3	48.5	46.6	52.2
Iron treatment (%)	53.8	55.1	60.0	47.9	51.0	52.1	47.7	55.3	43.6	44.0	50.4
Active D use*	41.5	41.4	37.6	37.6	56.8	55.9	59.1	67.5	68.3	66.2	68.7

*Following 2015; use of drugs for the treatment of secondary hyperparathyroidism

ulating agents, with 22.1% of them being previous users. In all, 57.2% of the patients were taking iron treatment. Drug treatment for secondary hyperparathyroidism was used by 58.6% of the patients (intravenous vitamin D, 34.8%; vitamin D analogs, 27.3%; calcimimetics, 12.4%; oral vitamin D, 11.7%; and different combinations, 13.9%). The mostly used phosphate binder agent was calcium acetate (43.4 %), followed by sevelamer (27.3%) and calcium carbonate 13.9%. Data on Lanthanum use were not collected. In total, 19.2% of the patients did not use phosphate binders.

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 3.5% of the patients. In addition, double posi-

Table 4. Duration of renal replacement therapy

Time (years)	0-5	6-10	11-15	16-20	>20
Hemodialysis (%)	64.8	21.7	8.3	3.5	1.9
Peritoneal dialysis (%)	69.2	21.2	7.5	1.0	0.0

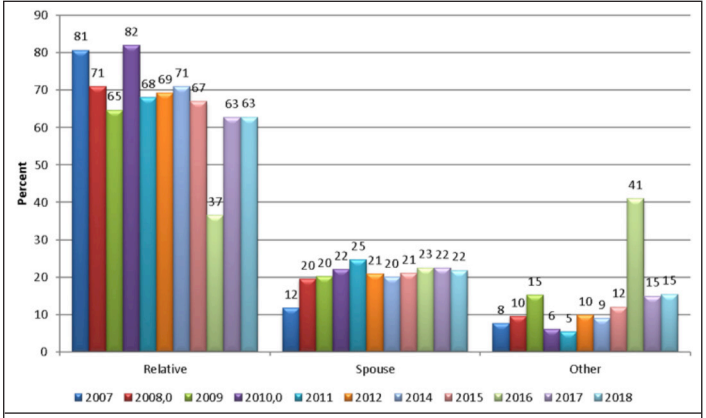

Figure 4. Relationship of the living donor with the recipient.

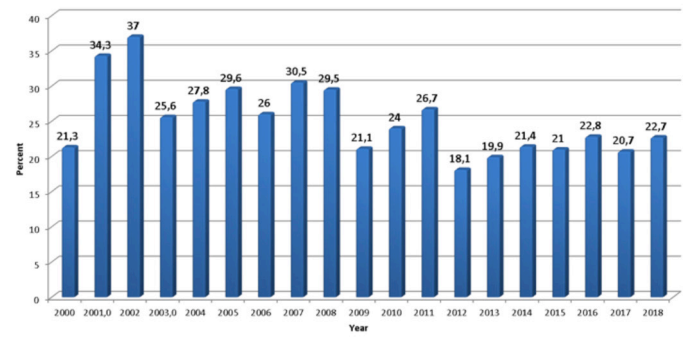

Figure 5. Cadaveric kidney transplantation rate by years.

tivity was observed in 0.2% of the patients. There was a noticed decrease in the prevalence of both HBV and HCV.

The distribution of patients with respect to hemodialysis treatment duration is presented in Table 4. In all, 35.2% of the patients were taking hemodialysis treatment for >5 years. During 2018, 8980 patients on hemodialysis died. Cardiovascular diseases (48%) were the most common causes of death, followed by cerebrovascular causes and malignancy.

Peritoneal Dialysis

As of the end of 2018, the total number of patients on peritoneal dialysis was 3192. There was a continued decrease in the number of patients on peritoneal dialysis during the last decade. The lack of recruitment of new patients is an essential factor that can be partially related to the increased transplantation activity. The male patients were 49.2%, whose age distribution is shown in Table 1. The total number of incident patients for 2018 was 886. The most common cause of kidney failure was hypertension in 29.1% of the patients, followed by diabetes mellitus in 27.5%, glomerulonephritis in 7.4%, polycystic kidney disease in 6.9%, and other causes 15.9%. The etiology was unknown in 13.2% of the patients. The frequency of hypertension was high; however, it is not possible to differentiate between primary and secondary hypertension due to renal disease.

The blood pressure in 26.4% of patients was above the threshold limit of 140/90 mmHg. The changes in treatment-related parameters are summarized in Table 3. Albumin, which is an essential nutritional marker, was <3.5 g/dL in 26.1% of patients, whereas it was above 4 g/dL in 21.1% of the patients. During the last decade, the frequency of hypoalbuminemia was in the range of 25%-30%. In total, 52.2% of the patients were current users of erythropoiesis-stimulating agents, with 18.3% of them being previous users. In total, 50.4% of the patients were taking iron treatment. In fact, most of the patients on peritoneal dialysis were administered iron via the oral route (84.8%). Drug treatment for secondary hyperparathyroidism was used by 68.7% of the patients (oral vitamin D, 55.8%; calcimimetics, 14.9%; vitamin D analogs, 14.7%; and intravenous vitamin D, 0.2%). The most used phosphate binders were calcium acetate (42.5%), followed by sevelamer (22.3%) and calcium carbonate (15.3%).

Obesity (8.4%) was the common complication followed by peritonitis and hernia (6.1%), inadequate dialysis (4.6%), dialysate leakage (4.4%), ultrafiltration failure (3.6%), and drainage problems (3.1%).

The positivity of HbsAg and anti-HCV was present in 2.0% and 1.2% of the patients, respectively. In some patients, there was double positivity of HbsAg and anti-HCV (0.2%). There was a decrease in the prevalence of HBV and HCV. Human immunodeficiency virus was positive in one patient.

The distribution of patients with respect to the duration of peritoneal dialysis is presented in Table 4. In all, 30.8% of the patients were on peritoneal dialysis for >5 years. The most common cause of death was cardiovascular disease (54.3%), followed by cerebrovascular disease (12.9%) and infection (12.9%).

Transplantation

Over the years, there has been a gradual increase in kidney transplantation procedures in Turkey. According to the data provided by the Ministry of Health during 2018, 3871 kidney transplantation procedures were performed. In total, 64.3% of the recipients were male, and the age distribution is shown in Table 1. Most of the patients were aged between 20 and 44 years. Most of the patients were living donors (77.9%). First-degree relatives were the most common source of living donors (35.2%), followed by spouses (21.8%). The incidence of non-related donors was 9.4%.

Longitudinal data regarding living donor types is presented in Figure 4. The rate of cadaveric transplantation was 22.2%, and the longitudinal data regarding the donor type is shown in Figure 5.

The most common cause of kidney failure was hypertension (16.6%), followed by diabetes (16.1%), glomerulonephritis (15.3%), and polycystic kidney disease (5.6%). Primary etiology is not known in 24.6% of the patients. It should be noted that hypertension might be a secondary cause, at least in some patients. Previous RRT type was hemodialysis in 52.0% of the patients and peritoneal dialysis in 4.1%. The high rate of pre-emptive transplantation should be noted.

The prognosis of the new transplantations was evaluated according to the data of 3871 patients. In all, 167 deaths were reported due to new transplantations in the same year, with a mortality rate of 2.5% for live donors and 10.8% for cadaveric donors. Besides, while evaluating these figures, it should be noted that the number of live donors in our country is high. Death occurs mainly due to infection (41.3%) and cardiovascular (27.5%) reasons.

DISCUSSION

It may be more accurate to consider the trend-forming changes while examining the change in the registry data over the years. Annual volatilities not associated with actual change can be caused by several reasons such as data collection methods, center features, and dataset properties. Epidemiological studies such as CREDIT and TURDEP have shown that the rate of diabetes mellitus has witnessed an approximate two-fold increase in our country in the last decade (2, 3). When we look at the etiologic distribution of the incidence of incidental hemodialysis in our registry, we observed that the rate of patients with diabetes increased to approximately 40%. These data prove that diabetes mellitus and diabetic nephropathy have become the first major points of the nephrology agenda. The mean age of patients with diabetes is higher than that of the other patients, and the prevalence of vascular access and cardiovascular disease for hemodialysis in these patients is much higher than that in patients without diabetes due to widespread and severe vascular diseases. In our country, hemodialysis is the most common type of RRT. There is a continuous development of significant qualitative improvements in this treatment method. The number of patients undergoing peritoneal dialysis had witnessed a continued decrease since 2006. This trend has seemingly come into existence especially due to the lack of new patient recruitment and an increase in pre-emptive transplantation activity.

The incidence of transplantation has witnessed a continued increase. In terms of the number of living transplantation, our country has reached the top rankings according to many metrics in the world. Choosing the appropriate live donor is extremely essential. The pre-emptive transplantation rate, which was 38.4% in the previous year, increased to 43.9% this year. This high rate is remarkable and raises some concerns about the timing of the transplantation. In 2018, 9.4% of living donor transplantation was made from the unrelated donors. There is a need to carefully monitor the ethical compliance of those patients.

Despite the increase in transplantation, the lack of the desired increase in the rate of cadaver-derived kidney transplantation is a growing concern of organ donation process from the cadaver. Besides, especially in cadaveric donor transplantations, mortality and graft loss rates are viewed as essential challenges in the first year, furthering the need to be closely monitored.

To increase renal transplantation, which is the most appropriate treatment in terms of mortality, patient's well-being, and cost-effectiveness, establishing an active organization among university, Ministry of Health, and community is essential for the health of our patients and the national economy. The state can provide various advantages to the family of cadaveric donors.

Registry data provide information about the 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 who are in the earlier stages of CKD is much higher. The CREDIT study revealed that CKD is a significant public health concern of our country (2). It also showed that the prevalence of CKD in adult population (aged >18 years) in Turkey was 15.7% and that of stage 5.2 CKD was 5.2%. The prevalence of hypertension, diabetes mellitus, obesity, and metabolic syndrome in our population is a major risk factor for both CKD and cardiovascular disease.

Registry studies and the CREDIT study have shown that CKD and end-stage renal disease are one of the most critical health problems of our country. The quality of RRT is improving each year, and it is nearly universally accessible in our country. The Ministry of Health initiated the National Kidney Disease Prevention Program with the objectives of preventing CKD, early diagnosis and treatment of CKD, and slowing the progression of CKD.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - N.S., K.A., G.S.; Design - N.S., K.A., G.S.; Supervision - K.A., G.S.; Materials - Data Collection and/or Processing - K.A., G.S.; Analysis and/or Interpretation - N.S., K.A.; Literature Search - N.S.; Writing - N.S., K.A., G.S.; Critical Reviews - K.A.,G.S.

Acknowledgements: The authors would like to thank the following;

- 2018 registry board members: Siren Sezer, Mehmet Rıza Altıparmak, Zeki Tonbul, Soner Duman and İsmail Koçyiğit.
- Staff of dialysis and transplantation centers that have been providing regular information to the board for years.
- Şeyda Gül Özcan for her help in the editing of the manuscript.
- The following physicians (listed alphabetically) for their contributions in the data collection process

Abdullah Şumnu, Abdullah Uyanık, Adem Ergin, Ahmet Saygılı, Alaattin Kalı, Ali Değirmenci, Ali Delibaş, Ali Kemal Kadiroğlu, Alper Azak, Alper Soylu, Aydın Güçlü, Aydın Türkmen, Aykut Sifil, Aysel Kıyak, Aysun Karabay Bayazıt, Barış Seloğlu, Belda Dursun, Beltinge D. Kılıç, Beril Akman, Bülent Ataş, Celalettin Usalan, Cengiz Keleş, Dilek Güven

Taymez, Dilek Torun, Dilek Yılmaz, Ebru Sevinç Ok, Ercan Balcı, Ergün Parmaksız, Erhan Tatar, Esra Baskın, F. Fevzi Ersoy, Fatma Ülkü Adam, Fuad Karslı, Garip Bekfilavioğlu, Garip Şahin, Gökhan Temiz, Gül Özensel Duman, Gülçin Kantarcı, Gülperi Çelik, Gülseren Pehlivan, Halim Tuncez, Harika Alpay, Harun Aktaş, Hasan Yıkar, Hülya Çolak, Hüseyin Seren, İbrahim Ortagedik, İhsan Ergün, İsmail Dursun, Kamil Dilek, Kenan Bahadırlı, Kenan Bek, M. Deniz Aylı, Medine Gülşen Serin, Mehmet Erol, Mehmet İşcan, Mehmet Karakaya, Mehmet Polat, Meltem Gürsu, Mesiha Ekim, Murat Duranay, Murat Karakaş, Murat Tıkıç, Murathan Uyar, Mustafa Başgümüş, Mustafa Sevinç, N. Yılmaz Selçuk, Neşe Özkayın, Neval Duman, Nevzat Yurdakul, Osman Akpınar, Osman Dönmez, Rezan Topaloğlu, Sebahat Tülpar, Selçuk Yüksel, Sema Akman, Serhan Tuğlular, Serhan Vahit Pişkinpaşa, Serpil Göksu, Sevcan Bakkaloğlu, Seyhun Kürşat, Sümeyra Koyuncu, Şeref Rahmi Yılmaz, Tahsin Güzelyurt, Tamer Arıkan, Tansu Sav, Turgay Arınsoy, Tülay Aksoy, Yakup Ekmekçi, Yavuz Yeniçerioğlu, Zeki Aydın, Zekiye Aytül Noyan

Conflict of Interest: Nurhan Seyahi is a member of the Turkish Society of Nephrology. Kenan Ateş is the current President of the Turkish Society of Nephrology, and Gültekin Süleymanlar is the Former President of the Turkish Society of Nephrology (2008-2011).

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Türkiye'de, Nefroloji-Diyaliz ve Transplantasyon. Registry 2018: Türk Nefroloji Derneği Yayınları; Miki Matbaacılık San. Ve Tic. Ltd. Şti. Ankara, 2019
2. Süleymanlar G, Utaş C, Arinsoy T, Ateş K, Altun B, Altiparmak MR, et al. A population-based survey of Chronic REnal Disease in Turkey - the CREDIT study. Nephrol Dial Transplant 2011; 26: 1862-71. [CrossRef]
3. Satman I, Omer B, Tutuncu Y, Kalaca S, Gedik S, Dinccag N, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. Eur J Epidemiol 2013; 28: 169-80. [CrossRef]