

# Current Status of Kidney Replacement Therapy in Türkiye: A Summary of 2022 Turkish Society of Nephrology Registry Report

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## ABSTRACT

**Background:** 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 33<sup>rd</sup> year of registry reports. The registry is in close collaboration with international registries.

**Methods:** In this paper, we summarized data from the 2022 registry report; additionally, we also provided yearly trends of managing end-stage kidney disease.

**Results:** The number of patients on kidney replacement therapy increases; at the end of 2022, 86 665 patients were on kidney replacement therapy. The prevalence and incidence of end-stage kidney disease were 1016.2 and 160.9 per million population, respectively. Diabetes was the most common cause of end-stage kidney disease. Hemodialysis (71.22%) was the most common type of treatment modality, followed by transplantation (24.68%) and peritoneal dialysis (4.1%).

**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:** Hemodialysis, kidney failure, peritoneal dialysis, registry, kidney replacement therapy, kidney transplantation

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## INTRODUCTION

Turkish Society of Nephrology's renal registry (Turkish renal registry) was founded in 1990 by Prof. Dr. Ekrem Ereğ, and this is the 33<sup>rd</sup> 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, peritoneal dialysis, and 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 and allow the comparison of KRT results in our country with the world data. This year, patient data were obtained from a total of 207 KRT centers, covering 26% of hemodialysis patients, 46% of peritoneal dialysis patients and 24% of transplant patients in our country.



**MATERIAL AND METHODS**

In this article, we provide a summary of the 2022 registry report.<sup>1</sup> More comprehensive and detailed data can be found in the booklet “Registry of the nephrology, dialysis, and transplantation in Türkiye, Registry 2022” published by Turkish Society of Nephrology. Current and previous reports can be accessed from the website of Turkish Society of Nephrology ([www.tsn.org.tr](http://www.tsn.org.tr) or [www.nefroloji.org.tr](http://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 has been used since the year 2012.

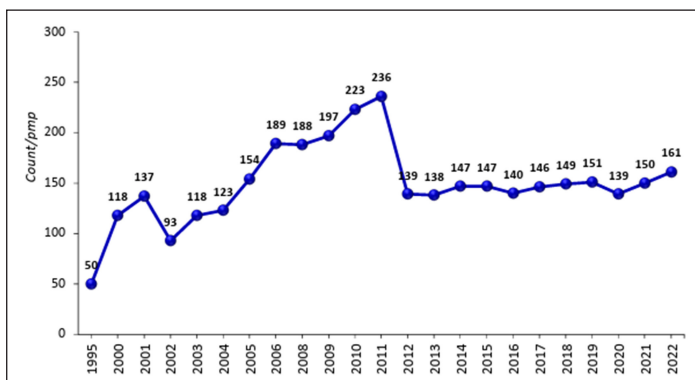
**RESULTS**

**Incidence and Prevalence**

At the end of the year 2022, there were a total of 86 665 patients who were on KRT. Following a yearly pause the number of patients on KRT increased again during the year 2022. The most commonly used KRT method in prevalent patients was hemodialysis (HD) (71.22%), followed by transplantation (24.68%) and peritoneal dialysis (PD)(4.1%). Incidence of KRT was calculated as 160.9 per million population (pmp) in 2022 and prevalence was calculated as 1016.2 pmp (including pediatric patients).

The annual incidence is higher in men (190.6 pmp) than in women (131.2 pmp), and it increases with age. The incidence of end-stage kidney disease (ESKD) treated with HD or transplantation is significantly higher in men than in women, while those treated with PD does not differ significantly by gender. The incidence of ESKD treated with HD gradually increases with age. For PD, this increase is less pronounced. The incidence of ESKD treated with transplantation is highest in the young and middle age groups.

The rate of diabetic patients is 36.7% in the incident patients who started KRT. Diabetic patient ratio was highest in HD patients (38.4%) and lowest (18%) in kidney transplant patients

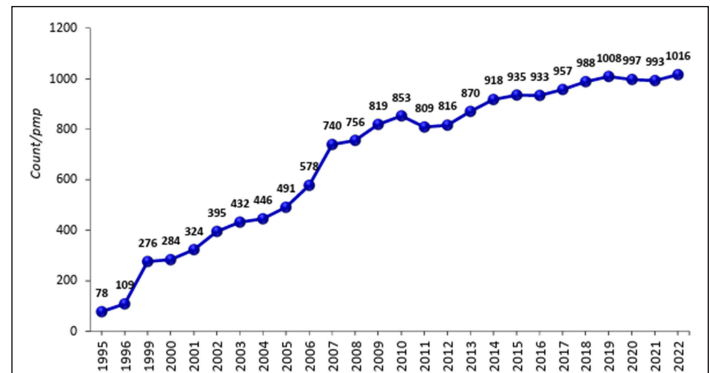


**Figure 1.** Incidence of patients on kidney replacement therapy by years. Since 2012, patient-based data provided by the Ministry of Health are used for the calculations.

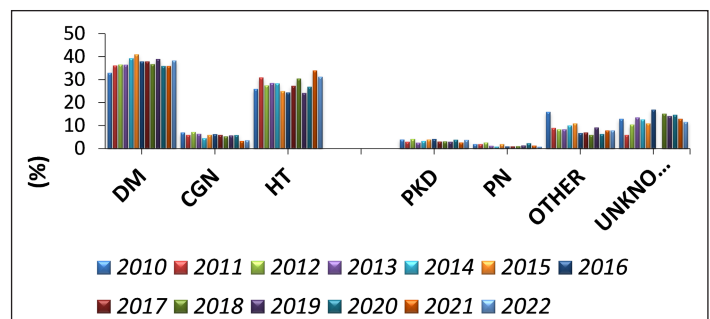
(preemptive). Yearly changes in incidence and prevalence are shown in Figures 1 and 2. An increasing trend has been observed in the incidence of ESKD requiring KRT, which has shown a nearly sideways course in the last 10 years, in 2022 compared to previous years. It was noted that the prevalence of ESKD requiring KRT, which decreased in 2020 and 2021 due to the impact of the coronavirus disease 2019 (COVID-19) pandemic, increased in 2022. Home HD treatment, which has become increasingly widespread in recent years, is largely implemented in private centers.

**Hemodialysis**

In the year 2022, there has been an increase in the number of incident HD patients (10 340) compared to the previous year (9517). The current figures have surpassed the pre pandemic level of 9630. The number of prevalent HD patients (61 723), including those on home HD, also increased compared to last year (60 051). The number of patients undergoing home HD has risen to 1257, indicating an increase compared to the previous year (1107). The age distribution of in-center HD patients is shown in Table 1. It should be noted that more than 50% of the patients were over the age of 65. In incident patients, the most common cause of kidney failure is diabetes mellitus (38.36%), followed by hypertension (32.29%), polycystic kidney disease



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



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

(3.78%), glomerulonephritis (3.66%), and other causes. Primary etiology is unknown in 11.64% 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 to underlying kidney disease. The incidence of diabetes is increasing with age. In 31.1% of new HD patients, dialysis is initiated under urgent conditions. The current rate has decreased compared to the previous year's rate of 56.4%.

The most common type of vascular access at the initiation of HD was tunnelled catheters in 51.64%, followed by arteriovenous fistulae in 28.7%, untunnelled catheters in 19.45%, and arteriovenous grafts in 0.21%. Longitudinal data regarding arteriovenous access are shown in Table 2. The arteriovenous fistula was the most common type of access in prevalent patients (70.89%); however, the increasing use of catheters should be noted. Among monitored patients, the usage rate of catheters (tunnelled or untunnelled) is 28.2%. There has been a continued trend of decreasing fistula usage rates in recent years. The most common access site for untunnelled catheter placement was the internal jugular vein (55.64%), followed by femoral (25.14%) and subclavian (12.89%) 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, 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 is observed in 2022 (Table 2), a trend that is contrast to the increase in Kt/V values in the previous years. As of the end of 2022, Kt/V is over 1.4 in 65.7 of the patients.

A blood pressure target of <140/90 mmHg was achieved in 74.31% of HD patients, either with antihypertensive treatment or not. Yearly changes of various parameters regarding HD treatment are listed in Table 3. The frequency of patients with hypoalbuminemia was decreased; as of the year 2022, the albumin level was above 4.0 g/dL in 66.84%. Erythropoiesis stimulating agents were currently used in 56.47% of the patients, and 27.27% were previously used. It was observed that more than half of the patients had hemoglobin levels above 11 g/dL (56.42%). Iron treatment was used by 55.98% of the patients. Drug treatment for secondary hyperparathyroidism was used by 57.13% (IV vitamin D 48.51%, vitamin D analogs 18.46%, calcimimetics 10.03%, oral vitamin D 8.50%, different combinations 14.5%). The most frequently used phosphate binder agent was calcium acetate (40.06%), followed by sevelamer (21.01%), calcium carbonate (16.12%), and lanthanum (3.78%). Phosphate binders were not used by 19% of the patients.

Hepatitis B virus (HBV) surface antigen (HBsAg) was positive in 2.35% of the patients, and anti-hepatitis C virus (HCV) antibody

was positive in 2.33% of the patients, double positivity was observed in 0.11% of the patients. Prevalence of HCV is decreasing. There were 36 patients with human immunodeficiency virus (HIV) positivity.

Cardiovascular diseases were the most common cause of death (46.28%), followed by infections (11% non-COVID-19 vs. 6.75% COVID-19 infection), cerebrovascular events (9.66%), and malignancy (9.57%).

The number of patients in home HD is increasing, as of the year 2022 there is a total of 1257 patients on home HD and 153 of them are incident patients. In this year's registry booklet, data on home HD are presented in more detail in a separate section.

### Peritoneal Dialysis

As of the end of the year 2022, the total number of PD patients was 3552; similar to previous 2 years a slight increase in the number of I PD was observed following a decade-long decrease trend. Male patients were 48.45% of the cases, the age distribution can be seen in Table 1. The total number of incident patients for the year 2022 was 1367. The most common cause of incident ESKD was hypertension in 34.53% of the cases, followed by diabetes mellitus in 29.69%, glomerulonephritis in 5.69%, and polycystic kidney disease in 4.21%. The etiology was unknown in 9.05% 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 32.56% 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 26.62% of the cases and it was above 4 g/dL in 19.77% of the cases. During the last decade, hypoalbuminemia frequency was in the range of 25%-30%. Erythropoiesis stimulating agents were currently used by 43.02% of the patients; 19.16% of them had previously used those agents. Iron treatment was used by 35.92% of the patients; most PD patients had used iron using the oral route (65.59%). Drug treatment for secondary hyperparathyroidism was used by 56.06% of the patients (oral vitamin D by 55.79%, calcimimetics by 11.57% and vitamin D analogs by 23.14%). The most used phosphate binders were calcium carbonate (30.23%), followed by calcium acetate (26.06%) and sevelamer (22.73%).

Hernia (7.56%) was the most common complication excluding peritonitis; it is followed by inadequate dialysis (4.89%), obesity (4.05%), dialysate leakage (3.9%), and ultrafiltration failure (3.21%).

HBsAg positivity was present in 1.94%, and anti-HCV positivity was present in 0.83%. It was observed that there was only 1 HIV positive patient.

The most common cause of death was cardiovascular disease (43.01%), followed by infection (8.29% COVID-19, 7.77% non-COVID) and cerebrovascular disease (5.18%).

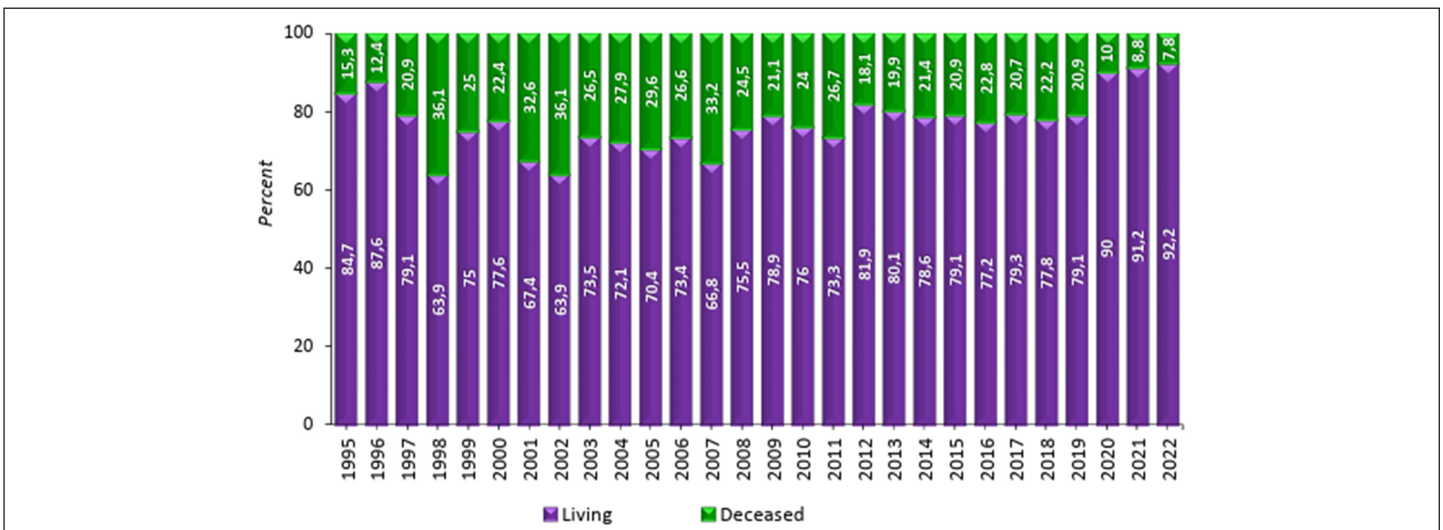
**Transplantation**

Kidney transplantation performed in Türkiye is gradually increasing over the years; a decrease was noted in the year 2020 that was related to COVID-19 pandemic. There is again an increase in the number of kidney transplantations compared to the year 2021. According to the data provided by the Ministry of Health during the year 2022, 3621 kidney transplantations were performed. The total number of transplants has approached the level before the COVID-19 pandemic (3858). Compared to previous year, this corresponds to an increase of 35%. Recipients were generally male (63.78%). 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 (92.24%). First-degree relatives were the most common source of living donors (31.56%), followed by second degree

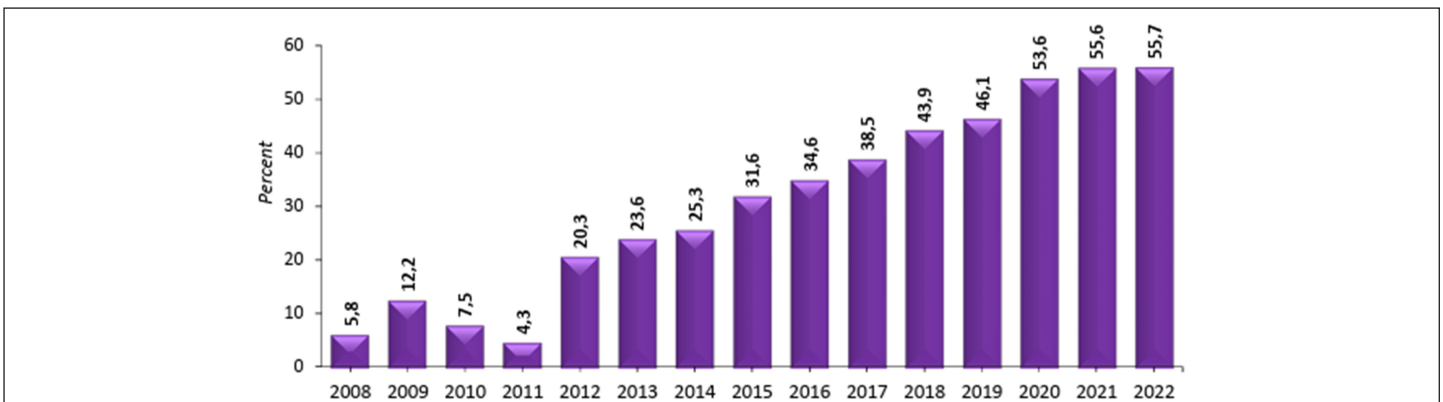
relatives 19.94% and paired exchange 6.32%. The incidence of non-related donors was 16.95%.

The rate of cadaveric transplantation was 7.76%, Longitudinal data regarding donor type is shown in Figure 4. The most common cause of kidney failure was diabetes mellitus (19.72%), followed by hypertension (25.15%), glomerulonephritis (10.74%), and polycystic kidney disease (5.78%). Primary etiology was not known in 19.72% of the cases. It should be noted that hypertension might be secondary, at least in some cases. Previous KRT type was HD in 39.82% of the patients and PD in 3.29%. The high rate (55.73%) of preemptive transplantation should be noted. The trend showing 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 3621 transplantations. A total of 111 deaths were reported in the new transplantations in the same year, with a mortality rate of 2.72% for live donors and 7.12% for cadaveric



**Figure 4.** Donor source in incident kidney transplant patients.



**Figure 5.** Preemptive transplantation rates by years.

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 with actual change: data collection method, center features, and data set properties. The first official COVID-19 case in our country was detected on March 11, 2020. The pandemic had a significant impact in the years 2020 and 2021. This year, we are beginning to observe the first data post pandemic.

A clear trend of the increase was seen not only in the number of prevalent, but also in incident KRT patients. In the year 2022, there has been an increase in the number of incident HD patients (10 340) compared to the previous year (9517). The current figures have surpassed the pre pandemic level of 9630. The number of prevalent HD patients (61 723), including those on home HD, also increased compared to the last year (60 051).

Specifically, there is a remarkable reduction in incidence in the year 2012. Since 2012, incidence and prevalence calculations were done using patient-based data collected by the Ministry of Health. In years prior, center-based data collected by the Turkish Society of Nephrology was 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 Chronic Renal Disease in Türkiye (CREDIT) and Turkish Epidemiology Survey of Diabetes, Hypertension, Obesity and Endocrine Disease (TURDEP) have shown that the rate of diabetes mellitus has increased approximately 2-fold in our country in the last 10 years.<sup>2,3</sup> 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 non-diabetic patients due to widespread and severe vascular disease. Hemodialysis is the most common form of KRT; distortion in some quantitative and qualitative aspects of this treatment was noted this year. The number of both incident and prevalent patients on HD has increased. The number of home HD patients has increased to 1257 and it is noteworthy that there is a significant increase compared to the previous year (1107). The number of patients with acceptable Kt/V and number of patients with low albumin levels were improved compared to those of the last year.

As of the end of 2022, the most commonly used vascular access method in center-based HD patients is the AV fistula (70.9%).

The high utilization of AV fistulas in chronic patients is a desirable condition. However, there has been a continued trend of decreasing fistula usage rates in recent years. This trend may be associated with an increase in diabetic and elderly patients with problematic vascular structure. Efforts should be made to prevent this trend from leading to a fundamental change in the routine creation of vascular access.

There was a clear trend of a decrease in PD patients number from 2006 until 2019, due probably to both lack of new patient recruitment and the increase in preemptive transplantation activity. Following a decade-long decreasing trend, we observed an increase in the number of prevalent PD patients in the last 4 consecutive years (3292 in 2019, 3387 in 2020, 3417 in 2021, and 3552 in 2022). This should be monitored before declaring the end of this decade-long decrease trend. Peritoneal dialysis was started as the first KRT to a total of 1367 patients in 2022. A steady increase in the number of incident PD patients in the last 5 years is noteworthy. It is noteworthy that incident PD patients are younger and less diabetic than incident HD patients. In contrast to the high rate in HD (31% in 2022), only 12% of incident PD patients were started on dialysis in an urgent setting. However, literature data suggest that PD is at least as safe an option as HD in patients who start dialysis in urgent conditions. It is seen that 75% of the prevalent PD patients are hypertensive. The rate of hypertensive patients is higher in PD than in HD. This high rate suggests that volume control should be improved in PD patients. Serum albumin level is below 3.5 g/dL in 26.6% of patients. The rate of patients with hypoalbuminemia increased compared to the previous year (21.1%). As in previous years, phosphorus control in PD patients is found as satisfactory. Serum phosphorus level is above 5.5 mg/dL in only 25% of patients. 73.5% of patients use phosphorus-binding drugs. This rate decreased slightly compared to last year (80%). Unlike previous years, calcium carbonate was the most preferred phosphorus binder (30.2%).

The rate of transplantation from a cadaveric donor is 7.76%. The decrease in the cadaveric transplant rate observed during the COVID-19 pandemic continues. The rate, which was 8.8% last year, decreased further this year. Considering that the negative effects of the pandemic on the health system have decreased, the reasons for this decline should be seriously questioned. The rate of preemptive transplantation is even higher this year compared to that of the last year (55.73% vs. 53.6%). Those high numbers raise some concerns about the correct timing of transplantation.

In terms of the number of living transplantations, Türkiye has reached the top rankings globally, according to many metrics. Choosing the appropriate live donor is very important. In 2022, 16.95% 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 kidney transplantation, which is the best treatment in terms of mortality, patient well-being, and cost-effectiveness, establishing an active organization between transplantation centers, ministry of health, and community is essential for our patients' health and the national economy.

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. CREDIT study revealed that CKD is a significant public health problem for our country.<sup>2</sup> 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. Besides, the quality of KRRT is improving each year, and it is nearly universally accessible in our country.

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H.Z.T., E.T., Z.Y., E.G.O., E.T., K.A.; Materials – N.S., I.K., N.E., K.A.; Data Collection and/or Processing – N.S., I.K., N.E., H.Z.T., E.T., Z.Y., E.G.O., E.T., K.A.; Analysis and/or Interpretation – N.S., I.K., N.E., H.Z.T., E.T., Z.Y., E.G.O., E.T., K.A.; Literature Search – N.S., I.K., N.E., H.Z.T., E.T., K.A.; Writing Manuscript – N.S., I.K., N.E., K.A.; Critical Review – N.S., I.K., N.E., H.Z.T., E.T., Z.Y., E.G.O., E.T., K.A.

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