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## Observational Study

## Psychological review of hemodialysis patients and kidney transplant recipients during the COVID-19 pandemic

Ayşe Gökçen Gundogmus, Ebru Gök Oğuz, Sanem Güler-Cimen, Yasemin Kocyyigit, Ahmet Emin Doğan, Mehmet Deniz Ayli

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## Abstract

### BACKGROUND

Kidney transplantation (KT) and end-stage renal disease (ESRD) requiring hemodialysis (HD) increase the incidence of morbidity and mortality associated with coronavirus disease 2019 (COVID-19) infection. The COVID-19 pandemic has had a negative effect on the psychological well-being of COVID-19 patients, especially those with a high-risk of infectious complications. The prevalence of anxiety and depression is known to be higher in ESRD patients undergoing HD than in the general population. On the other hand, KT recipients have different treatment requirements compared to HD patients, including adherence to complex immunosuppressive regimens and compliance with follow-up appointments. We hypothesized that psychosocial difficulties and stressors would differ between ESRD patients undergoing HD and KT recipients during the COVID-19 pandemic. If so, each group may require different interventions to maintain their psychosocial well-being.

### AIM

To measure and compare the levels of stress, anxiety, depression, concerns related to the pandemic, and coping skills in ESRD patients undergoing HD and KT recipients during the COVID-19 pandemic.

## METHODS

This cross-sectional study was performed at a training and research hospital. The study included ESRD patients undergoing HD (HD group) and KT recipients (with stable graft function for  $\geq 6$  mo prior to the study) (KT group). Patients completed a demographics form, the impact of events scale, the hospital anxiety and depression scale, and the Connor-Davidson resilience scale. Laboratory findings at the last clinical follow-up were recorded. The  $\chi^2$  test was used to assess the relationship between the HD and KT groups and the categorical variables. The relationships between the scale scores were analyzed using Pearson's correlation test, and differences between the groups were analyzed using the independent groups *t*-test.

## RESULTS

The study included 125 patients, of which 89 (71.2%) were in the HD group and 36 (28.8%) were in the KT group. The levels of anxiety and depression were higher in the HD group than in the KT group [ $9.36 \pm 4.38$  vs  $6.89 \pm 4.06$  ( $P = 0.004$ ) and  $8.78 \pm 4.05$  vs  $6.42 \pm 4.26$  ( $P = 0.004$ ), respectively], whereas the post-traumatic stress score was higher in the KT group [ $46.75 \pm 13.98$  vs  $37.66 \pm 18.50$  ( $P = 0.009$ )]. The concern with the highest intensity in the HD group was transmission of COVID-19 to family and friends (93.3%) and in the KT group was loss of caregiver and social support (77.8%). Concerns regarding financial hardship, stigmatization, loneliness, limited access to health care services, failure to find medical supplies, and transmission of COVID-19 to family and friends were more prevalent in the HD group. Connor-Davidson resilience scale tenacity and personal competence, tolerance, and negative affect scores were higher in the KT group than in the HD group [ $43.47 \pm 11.39$  vs  $33.72 \pm 12.58$ ,  $15.58 \pm 4.95$  vs  $11.45 \pm 5.05$ , and  $68.75 \pm 17.39$  vs  $55.39 \pm 18.65$  ( $P < 0.001$ ), respectively]. Biochemical parameters, such as creatine, urea, phosphorus, parathyroid hormone, and calcium, were lower, and the albumin and hemoglobin values were higher in the KT group than in the HD group ( $P < 0.001$ ).

## CONCLUSION

Psychosocial difficulties and the level of stress differ in ESRD patients undergoing HD and KT recipients; therefore, psychosocial interventions should be tailored for each patient group.

**Key Words:** Kidney transplantation; Dialysis; Anxiety; Depression; Psychological resilience

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**Core Tip:** Hemodialysis patients and kidney transplantation recipients with viral infections have higher mortality and morbidity rates compared to the general population. These patients are at a high risk of infectious complications due to immunosuppression, and this risk triggers psychosocial stress. Considering the possible negative effects of this psychosocial stress, an in-depth psychological analysis was performed using validated scales. Specific concerns and stressors related to coronavirus disease 2019 (COVID-19) were identified in both patient groups. Overall, the main concern was transmitting COVID-19 to family and friends, followed by financial hardship, loneliness, and stigmatization. The present findings showed that it is crucial to tailor supportive psychological interventions to these vulnerable patient groups.

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## INTRODUCTION

Coronavirus disease 2019 (COVID-19) has a higher mortality rate in end-stage renal disease (ESRD) patients compared to the general population as these patients have comorbid immunosuppression[1]. Patients with ESRD and immunocompromised transplant recipients constitute one of the highest risk groups for COVID-19 infection[2]. In 2019 there were 61341 ESRD patients on hemodialysis (HD) in Turkey, and the number has increased by 10000 patients each year since[3]. Worldwide approximately 2 million people annually undergo HD or receive a kidney transplant to stay alive. The best treatment for ESRD is kidney transplantation (KT). The COVID-19-related mortality rate in KT recipients is reported to be 22%-50%[4]. This mortality rate can be higher in developing countries, such as Turkey. Turkey has

an insufficient budget for health care services[5]. Moreover, ESRD patients undergoing HD three times a week are at risk of contracting COVID-19 at HD centers[6,7], as they have a weakened immune system and receive dialysis in crowded conditions. The literature on COVID-19 is primarily focused on treatment and complication management. Clinical studies on the effect of the COVID-19 pandemic, including stressors and psychological trauma, in specific patient populations are lacking[8-17]. Nevertheless, it is predicted that the COVID-19 pandemic negatively affects the psychological well-being of patients, especially those at high-risk for contracting COVID-19[9].

Given the need for a better understanding of affect disorders in ESRD patients undergoing HD and KT recipients during the COVID-19 pandemic, the present study aimed to determine the prevalence and degree of anxiety and depression in KT recipients and HD patients and to compare them in terms of psychological resilience, traumatic stress, and the severity of depression and anxiety. It was hypothesized that psychosocial difficulties and areas of concern would differ between the ESRD patients undergoing HD and the KT recipients during the COVID-19 pandemic.

## MATERIALS AND METHODS

### **Study population and data collection**

This cross-sectional study was conducted at Saglik Bilimleri University, Ankara Diskapi Research and Training Hospital, Transplantation and Nephrology Clinic, Ankara, Turkey. The study included ESRD patients undergoing HD and KT recipients with stable graft function for  $\geq 6$  mo prior to the study. Data were collected between September 2020 and January 2021. Patients aged  $< 18$  years and  $> 65$  years, patients with documented organic mental disorders, epilepsy, dementia, delirium, and intellectual disability, patients that could not complete the study scales due to hearing-vision problems or a medical illness with significant cognitive sequelae, and those with a history of alcohol or substance abuse were excluded. Additionally, illiterate patients were excluded, as they could not complete the study scales. The Saglik Bilimleri University, Ankara Diskapi Research and Training Hospital Ethics Committee approved the study protocol, No. 10.08.2020-93/01, which was carried out in accordance with the declaration of Helsinki and the declaration of Istanbul. All study participants provided written informed consent.

Data for ESRD patients were collected during HD sessions between the first and last hours. KT recipients' data were collected during KT outpatient follow-up visits. All participants completed a sociodemographic data form, the impact of events scale-revised (IES-R), the Connor-Davidson resilience scale (CD-RISC), and the hospital anxiety and depression scale (HADS). HD initiation and KT dates were recorded. Additionally, routine laboratory parameters, including blood urea, creatinine, albumin, phosphorus, parathyroid hormone, calcium, hemoglobin, and C-reactive protein levels, were collected. Participants were also administered a visual analog scale to evaluate the level of perceived stress related to COVID-19 infection (1: None; 2: A little bit; 3: Moderate; 4: A lot; 5: Extreme). Non-compliance with medication and follow-up care was determined based on a yes/no question. Patients were divided into two groups: the HD group and the KT group.

### **Sociodemographic data form**

This form was used to record patient age, sex, level of education, marital status, occupational status, and tobacco and alcohol use. Additional questionnaire items queried concerns related to the COVID-19 pandemic such as personal health, the health of loved ones, loneliness, isolation, and financial hardship to discern the causes of distress.

### **HADS**

HADS is a self-report scale used to screen for anxiety and depression. The depression subscale considers anhedonia as the primary symptom. The cutoff points for the Turkish version are 10 for the anxiety subscale and 7 for the depression subscale. The scale was developed by Zigmond and Snaith[18] (1983) and was subsequently validated for use in the Turkish population by Aydemir *et al*[19] (1997).

### **IES-R**

IES-R is used to assess post-traumatic stress disorder (PTSD) using a 5-point Likert-type scale. The scale evaluates the severity of symptoms and has three sub-dimensions: re-experiencing; avoidance; and hyper-arousal. It was developed by Weiss and Marmar[20] (1997) and was validated for use in the Turkish population by Çorapçioğlu *et al*[21] (2006). The original cutoff value is 33[20]. The Turkish version of the scale is shown to have good diagnostic performance for cutoff points between 24 and 33 [21].

### **CD-RISC**

CD-RISC is used to assess psychological resilience using a 5-point Likert-type scale. The scale was developed by Connor and Davidson[22] and has five sub-dimensions; (1) Personal competence, high

standards, and tenacity; (2) Trust in one's instincts, tolerance of negative affect, and the strengthening effects of stress; (3) Positive acceptance of change and secure relationships; (4) Control; and (5) Spiritual influences. The Turkish reliability and validity study performed by Karairmak *et al*[23] (2010) determined that the Turkish version has three sub-dimensions: tenacity and personal competence; tolerance of negative affect; and tendency towards spirituality. Higher scores indicate higher levels of psychological resilience.

### Statistical analysis

Data were analyzed using IBM SPSS Statistics for Windows v.21.0 (IBM Corp., Armonk, NY, United States) and a 95% confidence interval was used. Categorical (qualitative) variables were shown as frequency and percentage, whereas quantitative variables were shown as mean  $\pm$  SD. Data were considered to have normal distribution if the kurtosis and skewness values were between  $-3$  to  $+3$ . Accordingly, the skewness and kurtosis statistics of the measurements showed they were normally distributed. Therefore, parametric methods were used for analysis.

The  $\chi^2$  test was used to assess the relationships between the two groups and the categorical variables. The relationships between the measurements/scores were analyzed using Pearson's correlation test, and differences between the groups were analyzed using the independent groups *t*-test. The level of statistical significance was set at  $P < 0.05$ .

## RESULTS

### Descriptive statistics and group comparisons

The study included 125 patients: 89 (71.2%) in the HD group and 36 (28.8%) in the KT group (Table 1). Among the KT recipients, 26 received live-related KT and 10 were transplanted from a deceased donor allocated through the Turkish Ministry of Health matching system. Live-related donors included 16 first-degree relatives and 10 second-degree relatives. Sex, occupational status, marital status, social support, cigarette smoking, and alcohol consumption did not differ between the HD and KT groups. The mean age in the HD group was  $54.75 \pm 15.43$  years *vs*  $44.54 \pm 9.93$  years in the KT group; the difference was significant ( $P < 0.001$ ). Additionally, the level of education was higher in the KT group ( $P < 0.001$ ).

More of the patients in the HD group had comorbidities than those in the KT group ( $P = 0.028$ ). Mean duration of ESRD was  $8.9 \pm 7.2$  years in the HD group *vs*  $15.2 \pm 6.4$  years in the KT group ( $P < 0.001$ ). The mean duration of follow-up was  $8.23 \pm 5.15$  years in the KT group. Biochemical parameters were significantly better in the KT group ( $P < 0.001$ ). Psychological variables, such as a history of psychiatric admission, and active psychiatric treatment did not differ significantly between the two groups (Table 1). Treatment non-compliance was reported by 20 (55.6%) of the patients in the KT group *vs* 5 (5.6%) in the HD group ( $P < 0.001$ ) (Table 1).

### Concerns regarding the COVID-19 pandemic

Patients in the two study groups had different concerns regarding the COVID-19 pandemic. The intensity of concerns is presented in Table 2. The main concern with the highest intensity was the transmission of COVID-19 to family and friends. This concern had moderate to severe intensity in 83 (93.3%) of the HD patients and 25 (69.4%) of the KT recipients. Significantly more of the patients in the HD group had this concern than those in the KT group. Similarly, concerns regarding financial hardship, loneliness, stigmatization, and failure to find medical supplies were more intense in the HD group. The intensity of concerns regarding contracting COVID-19, inability to access medical treatment, loss of caregiver and social support, limited access to health care services, and contracting COVID-19 from family and friends did not differ significantly between the two groups. The overall perceived stress score was significantly higher in the HD group than in the KT group ( $P < 0.001$ ) (Table 2).

### Assessment of depression, anxiety, and PTSD according to scale scores

The HADS anxiety subscale score was significantly lower in the KT group than in the HD group [ $9.36 \pm 4.38$  *vs*  $6.89 \pm 4.06$  ( $P = 0.004$ )] (Table 3), and the HADS depression subscale score was significantly lower in the KT group than in the HD group [ $8.78 \pm 4.05$  *vs*  $6.42 \pm 4.26$  ( $P = 0.004$ )]. The IES-R re-experiencing score did not differ significantly between the groups; however, the hyper-arousal, avoidance, and total scores were significantly higher in the KT group than in the HD group ( $P = 0.031$ ,  $P < 0.001$ , and  $P = 0.009$ , respectively). CD-RISC tenacity and personal competence and tolerance and negative affect scores were higher in the KT group ( $P < 0.001$  and  $P < 0.001$ , respectively). There was not a significant difference between the groups in the tendency towards spirituality. The CD-RISC total score was higher in the KT group ( $68.75 \pm 17.39$ ) than in the HD group ( $55.39 \pm 18.65$ ) ( $P < 0.001$ ) (Table 3).

Based on the cutoff score for the HADS anxiety sub-scale, 55.1% ( $n = 49$ ) of the HD patients and 25.0% ( $n = 9$ ) of the KT recipients had anxiety ( $P = 0.004$ ). According to the cutoff score for the HADS depression sub-scale, 73.0% ( $n = 65$ ) of the HD patients and 47.2% ( $n = 17$ ) of the KT recipients had

**Table 1 Sociodemographic and clinical data**

Characteristic	HD group, <i>n</i> = 89	KT group, <i>n</i> = 36	<i>P</i> value
Age in yr	54.75 ± 15.43	44.54 ± 9.93	< 0.001
Sex			
Male	42	22	0.225
Female	47	14	
Occupational status			
Permanent job	7	8	0.101
Temporary job	5	2	
Unemployed	77	26	
Marital status			
Single	40	12	0.321
Married	49	24	
Level of educational			
Low	36	2	< 0.001
Middle	42	14	
High	11	20	
Social network			
Support available	69	22	0.1
Not available	20	14	
Smoking	14	5	0.999
Alcohol consumption	2	1	0.999
Comorbidities	68	20	0.028
ESRD duration in yr	8.9 ± 7.23	15.2 ± 6.4	< 0.001
Transplant follow-up in yr	-	8.23 ± 5.15	-
Creatinine in mg/dL	8.64 ± 1.36	1.37 ± 0.52	< 0.001
Urea in mg/dL	212.72 ± 71.13	45.1 ± 18.83	< 0.001
Albumin in g/L	4.17 ± 0.36	4.43 ± 0.31	< 0.001
Phosphorus in mg/dL	5.29 ± 1.38	3.38 ± 0.8	< 0.001
Parathyroid hormone in ng/L	690.63 ± 580.97	84.22 ± 58.65	< 0.001
Calcium in mg/dL	7.78 ± 0.83	9.38 ± 0.58	< 0.001
Hemoglobin in g/dL	10.43 ± 1.61	13.01 ± 2.02	< 0.001
Previous psychiatric diagnosis	21	10	0.794
Active psychiatric treatment	9	4	0.999
Non-compliance with treatment	5	20	< 0.001

ESRD: End-stage renal disease; HD: Hemodialysis; KT: Kidney transplantation.

depression ( $P = 0.011$ ). The IES-R cutoff score showed that significantly more patients in the KT group ( $n = 32$ ) were experiencing post-traumatic stress as compared to those in the HD group ( $n = 57$ ) ( $P = 0.010$ ).

## DISCUSSION

ESRD is a global health problem, and the best treatment option is KT; however, both ESRD and KT render patients susceptible to infectious diseases, including COVID-19[6,7,24]. ESRD patients cannot

**Table 2 Patient concerns regarding the coronavirus disease 2019 pandemic**

Concerns	Intensity	HD group, n	%	KT group, n	%	P value
Contracting COVID-19	None/very mild	9	10.1	7	19.4	0.118
	Mild	8	9.0	6	16.7	
	Moderate/severe	72	80.9	23	63.9	
Inability to access medical treatment	None/very mild	9	10.1	5	13.9	0.125
	Mild	9	10.1	8	22.2	
	Moderate/severe	71	79.8	23	63.9	
Loss of caregiver and social support	None/very mild	7	7.9	6	16.7	0.337
	Mild	7	7.9	2	5.6	
	Moderate/severe	75	84.3	28	77.8	
Financial hardship	None/very mild	3	3.4	6	16.7	< 0.001
	Mild	8	9.0	11	30.6	
	Moderate/severe	78	87.6	19	52.8	
Loneliness	None/very mild	9	10.1	14	38.9	< 0.001
	Mild	11	12.4	10	27.8	
	Moderate/severe	69	77.5	12	33.3	
Stigmatization	None/very mild	10	11.2	20	55.6	< 0.001
	Mild	7	7.9	3	8.3	
	Moderate/severe	72	80.9	13	36.1	
Limited access to health care services	None/very mild	8	9.0	8	22.2	0.05
	Mild	13	14.6	8	22.2	
	Moderate/severe	68	76.4	20	55.6	
Failure to find medical supplies	None/very mild	9	10.1	7	19.4	< 0.001
	Mild	11	12.4	14	38.9	
	Moderate/severe	69	77.5	15	41.7	
Transmission of COVID-19 to family and friends	None/very mild	2	2.2	7	19.4	0.001
	Mild	4	4.5	4	11.1	
	Moderate/severe	83	93.3	25	69.4	
Contracting COVID-19 from family and friends	None/very mild	2	2.2	3	8.3	0.064
	Mild	8	9.0	7	19.4	
	Moderate/severe	79	88.8	26	72.2	
Overall perceived stress score	None/very mild	3	3.4	6	16.7	< 0.001
	Mild	6	6.7	11	30.6	
	Moderate/severe	80	89.9	19	52.8	

COVID-19: Coronavirus disease 2019; HD: Hemodialysis; KT: Kidney transplantation.

survive without dialysis, and HD requires patients to travel to a dialysis center  $\geq$  three times per week. This increases the risk of exposure to patients with COVID-19 infection[6]. Moreover, ESRD patients and KT recipients need to adhere to strict treatment protocols, including dietary/fluid restriction, physical activity, poly-medication use, and follow-up visits.

In the present study COVID-19-related concerns in the HD and KT groups were analyzed. Additionally, depression, anxiety, post-traumatic stress, and psychological resilience scores were measured using HADS, IES-R, and CD-RISC, respectively, and compared between the HD and KT groups. Sociodemographic data in both groups were consistent with Turkish national data showing that KT recipients are younger and have a higher level of education than HD patients. A high level of

Table 3 Scale scores

Scores	HD group, mean $\pm$ SD	KT group, mean $\pm$ SD	P value
HADS			
Anxiety score	9.36 $\pm$ 4.38	6.89 $\pm$ 4.06	0.004
Depression score	8.78 $\pm$ 4.05	6.42 $\pm$ 4.26	0.004
IES-R			
Re-experiencing score	13.70 $\pm$ 7.31	16.25 $\pm$ 6.07	0.066
Hyper-arousal score	9.44 $\pm$ 5.91	11.56 $\pm$ 4.41	0.031
Avoidance score	14.53 $\pm$ 6.38	18.94 $\pm$ 4.85	< 0.001
Total score	37.66 $\pm$ 18.50	46.75 $\pm$ 13.98	0.009
CD-RISC			
Tenacity and personal competence score	33.72 $\pm$ 12.58	43.47 $\pm$ 11.39	< 0.001
Tolerance and negative affect score	11.45 $\pm$ 5.05	15.58 $\pm$ 4.95	< 0.001
Tendency towards spirituality score	10.28 $\pm$ 2.83	9.75 $\pm$ 2.90	0.347
Total score	55.39 $\pm$ 18.65	68.75 $\pm$ 17.39	< 0.001

CD-RISC: Connor-Davidson resilience scale; HADS: Hospital anxiety and depression scale; HD: Hemodialysis; IES-R: The impact of events scale-revised; KT: Kidney transplantation.

education (high school or university) may make it easier to navigate the healthcare system and consequently obtain better healthcare services. Additionally, individuals with a high level of education might have higher levels of self-efficacy and internal control, which may lead to improved treatment compliance. Individuals with a high level of education may have better health literacy, which might also result in better treatment compliance. The relationship between the level of education and psychosocial stress, coping skills, and treatment compliance are likely multifactorial and complex. As such, the difference in the level of education between the present study's HD and KT groups might contribute to the differences in depression/anxiety and psychological resilience levels that were observed. Until the mechanisms underlying these observed differences are elucidated, medical professionals should be cognizant of the detrimental effects of a low level of education (less than high school) on stress, anxiety, and coping skills.

Sex distribution in the present study's groups did not differ significantly and was consistent with Turkish national data[3]. In addition, a history of psychiatric diagnosis and active psychiatric treatment did not differ significantly between the HD and KT groups. The self-reported treatment non-compliance rate was higher in the KT group than in the HD group, which might have been related to the ongoing nature of HD treatment.

There were several concerning issues for patients receiving HD and KT patients during the COVID-19 pandemic[25]. In the present study the KT recipients reported having less concern than HD patients for financial hardship. Concerns about loneliness and stigmatization were more intense in the HD group. Similarly, concerns about the failure to find medical supplies and transmitting COVID-19 to family and friends were more common in the HD group, which might have been due to their dependence on HD treatment. In contrast, the KT recipients might have had a false sense of security, as they do not require routine HD post-transplantation and therefore have a high rate of non-compliance with medications and follow-up visits. Considering all these factors, the overall perceived stress score was significantly higher in the HD group.

The present study's HD group had significantly higher HADS anxiety and depression scores than the KT group, which agrees with the higher perceived stress levels in the HD group. Cimen *et al*[26] studied HD patients who were waitlisted for KT and reported that the diagnosis of ESRD and undergoing HD and arteriovenous fistula surgery had an anxiety-inducing effect. A study on solid organ transplant recipients showed that wait-listed patients reported higher levels of anxiety related to the COVID-19 pandemic than patients that had already undergone transplantation, which agrees with the present findings[11]. Moreover, it was previously reported that depression and anxiety levels in HD patients are higher than in KT recipients, as in the present study[27]. The mean age in the present study's HD group was higher than in the KT group and the fact that the risks associated with COVID-19 infection increase with age might have played a role in the observed higher level of anxiety in the HD group[2]. The necessity of regular treatment at a dialysis center and the inability to comply with recommended quarantine/social distancing rules may play a role in the high level of anxiety among HD patients[15].

IES-R avoidance, hyper-arousal, and total scores in the present study were higher in the KT group than in the HD group. When the scores were evaluated for their cutoff values the significance of the IES-R scale persisted. This highlighted the fact that the KT recipients had a higher level of post-traumatic stress than the HD patients. Starting from the immediate post-transplant surgery phase transplant recipients must live in isolation for 1 year, must pay particular attention to the home environment, and must limit social interaction due to the high risk of infection associated with immunosuppressive multidrug treatment, including prophylactic anti-viral, anti-bacterial, and immunosuppressive medications[28]. The COVID-19 pandemic required social isolation policies that mimicked those required by transplant recipients post-surgery. This similarity might have led the present study's KT recipients to experience post-traumatic stress more intensely than HD patients, who lacked any prior experience of social isolation. The KT recipients that had already experienced an existential discontinuity (*i.e.* a sudden interruption of self and everyday life) also experienced isolation and potential trauma related to post-transplantation isolation; these experiences might have led them to develop PTSD during the COVID-19 pandemic[4].

Psychological resilience and positive coping strategies can prevent PTSD[29]. It was reported that psychological resilience can also positively affect treatment compliance in HD patients. There is an inverse relationship between psychological resilience and psychological stress in KT recipients[30,31]. It has been shown that interventions that increase psychological resilience have positive effects on depression, anxiety, and perceived stress in transplant recipients[32]. CD-RISC tenacity and personal competence, tolerance and negative affect, and total scores were higher in the present study's KT group. This shows that the KT group had higher psychological resilience and lower levels of depression and anxiety. A low level of psychological resilience is among the risk factors for psychopathology. Research emphasizes the importance of strengthening the psychological resilience of individuals and societies [31].

Although the present study used a single-center design, it provides important insights into the psychosocial status of HD patients and KT recipients during the COVID-19 pandemic. The use of self-report scales can be considered a limitation of the present study. Additionally, due to the present study's cross-sectional design causality could not be determined. Another limitation of the study is the absence of a healthy control group, as COVID-related distress can also afflict healthy persons. The present findings might have been more valuable if the psychosocial status of the KT and HD patients during COVID-19 pandemic had been compared to that prior to the pandemic.

## CONCLUSION

In conclusion, the present findings show that HD patients had higher levels of stress and anxiety than KT recipients during the COVID-19 pandemic. The HD patients also had a higher degree of concern regarding financial hardship, loneliness, stigmatization, and failure to find medical supplies and treatment than KT recipients. In contrast, KT recipients had higher IES-R scores, indicating a greater degree of post-traumatic stress. The KT recipients also reported a higher rate of non-compliance with treatment than HD patients. Furthermore, the HD patients and KT recipients experienced different psychosocial difficulties during the COVID-19 pandemic.

## ARTICLE HIGHLIGHTS

### Research background

The recent coronavirus disease 2019 (COVID-19) pandemic has had significant psychological and social effects on the world's population. Research has highlighted the effect on the psychological well-being of the most at risk groups, including hemodialysis (HD) patients and kidney transplantation (KT) recipients, who are highly likely to develop post-traumatic stress disorder (PTSD), anxiety, depression, and other symptoms of distress. COVID-19-related social distancing negatively affected interpersonal relationships and empathy toward others. The aim of the present clinical study was to identify the effect of the COVID-19 pandemic on these two patient groups and consider possible interventions based on the findings.

### Research motivation

The psychological construct of coping, anxiety, depression, and psychological resilience has been studied in various patient populations and has more recently been applied in the field of transplant and end-stage renal disease (ESRD) psychology. The COVID-19 pandemic provided a good opportunity to study and explore the nature of stressors and their origins in KT recipients and ESRD patients undergoing HD.

### **Research objectives**

Prolonged stress during the COVID-19 pandemic can trigger anxiety, depression, and the inability to manage traumatic and negative emotions. Furthermore, the constant fear of contracting the disease negatively affects daily life and leads to social isolation, modifying human relations. These features can be more profoundly observed in patients with chronic illnesses, such as ESRD. The present study aimed to analyze the levels of anxiety and depression in ESRD patients undergoing HD and KT recipients. Additionally, the primary stressors and psychological resilience were surveyed and compared between the KT recipients and HD patients, which is crucial in order to tailor specific treatment for each group.

### **Research methods**

The participants of this cross-sectional study completed a sociodemographic data form, the impact of events scale-revised, Connor-Davidson resilience scale, and hospital anxiety and depression scale. HD initiation and KT surgery dates were recorded. Additionally, routine laboratory parameters, including blood urea, creatinine, albumin, phosphorus, parathyroid hormone, calcium, hemoglobin, and C-reactive protein, were measured. Participants were administered a visual analog scale to evaluate the level of perceived COVID-19-related stress. Non-compliance with medication and follow-up care was evaluated with a yes/no question. The study included two groups: The HD group and the KT group.

### **Research results**

The HD group was significantly older than the KT group. Additionally, the level of education was higher in the KT group than in the HD group. Patients in the two study groups had different concerns regarding the COVID-19 pandemic. The main concern with the highest intensity was the transmission of COVID-19 to family and friends in the HD group and the loss of caregiver and social support in the KT group. Concerns regarding financial hardship, loneliness, stigmatization, limited access to health care services, failure to find medical supplies, and transmission of COVID-19 to family and friends were more intense in the HD group. The levels of anxiety and depression were higher in the HD group than in the KT group, whereas the post-traumatic stress level was higher in the KT group. The rate of PTSD was significantly higher in the KT group as compared to HD group. The psychological resilience level was also higher in the KT group. In addition, in the KT group the reported non-compliance with treatment rate was significantly higher than in the HD group during the COVID-19 pandemic.

### **Research conclusions**

ESRD is a chronic condition characterized by kidney failure that requires either dialysis or KT for survival. Among these two treatment options, KT provides the best outcome, although at a cost. KT recipients must adhere to complex immunosuppressive regimens and medical follow-up. HD, on the other hand, is a more demanding treatment that requires visiting a dialysis center three times per week, blood work-ups, and the risk of exposure to COVID-19 in confined and crowded dialysis centers. The present study aimed to determine the levels of stress, anxiety, and depression, as well as psychological resilience and the frequency of PTSD in HD patients and KT recipients. The present findings highlight the differences in the COVID 19-related concerns and major stressors in the participants in the HD and KT groups. The levels of anxiety and depression were significantly higher in the HD than in the KT group. On the other hand, PTSD and non-compliance with treatment were more common in the KT group. These findings should help clinicians tailor specific support and treatment for HD patients and KT recipients.

### **Research perspectives**

Stress factors associated with the COVID-19 pandemic include fear of death, concerns about personal health and the health of loved ones, loneliness caused by social distancing mandates, concerns about the inability to access medical treatment, job loss, and financial hardship. The magnitude of these stressors and unknowns about COVID-19 and its treatment are likely to lead to PTSD in some individuals, and anxiety and depression set the stage for its development. ESRD patients constitute a vulnerable population, as the present findings show they have high levels of anxiety and depression and are prone to developing PTSD.

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## **FOOTNOTES**

**Author contributions:** Gundogmus AG and Guler-Cimen S are the guarantors and designed the study; All authors participated in the acquisition, analysis, and interpretation of data and drafted the initial manuscript; Gundogmus

AG, Guler-Cimen S, and Ayli MD revised the article for important intellectual content.

**Institutional review board statement:** This study was conducted at Ankara Diskapi Yildirim Beyazit Research and Training Hospital, Transplantation and Nephrology Clinic, affiliated with the Saglik Bilimleri University of Turkey, Ankara, Turkey. The local ethics committee approved the study protocol, No. 10.08.2020-93/01. The study was carried out in accordance with the Declaration of Helsinki and the Declaration of Istanbul.

**Informed consent statement:** All study participants provided written informed consent.

**Conflict-of-interest statement:** Preliminary results of this clinical study were presented as an oral abstract at the European Society for Organ Transplantation meeting held in Milan in 2021.

**Data sharing statement:** The technical appendix, statistical code, and dataset are available from the corresponding author at [sanem.cimen@sbu.edu.tr](mailto:sanem.cimen@sbu.edu.tr).

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