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ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2019, 8(1): 55-62

Prevalence of Anxiety and Depression and its Related Influencing Factors among Patients with End-stage Renal Disease on Hemodialysis in Al-Kharj, Saudi Arabia

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ABSTRACT

Background: *Chronic kidney disease (CKD) and End-stage renal disease (ESRD) is a prevalent and important non-communicable condition that poses a long-term global health burden. In Saudi Arabia, the previously available literature on the topic does not present sufficient evidence to produce sound guidelines for a better outcome and healthier life for the patients on hemodialysis.* ***Objective:*** *To assess the prevalence of anxiety and depression and its related influencing factors among CKD and ESRD patients on hemodialysis at the dialysis unit of King Khaled and the Military hospital in Al-Kharj city.* ***Methodology:*** *A cross-sectional study of Al-Kharj city's major hospitals was conducted from December 2016 to January 2017. The study included 144 CKD and ESRD patients on hemodialysis using a stringent set of inclusion and exclusion criteria. A standard self-administered questionnaire-the Hospital Anxiety and Depression Scale (HADS) was used in the study to measure the presence and severity of anxiety and depression in the study population. Appropriate statistical tests were used to identify associations between relevant factors and anxiety/depression.* ***Results:*** *Results were collated from 116 patients. There were 66 males and 50 females with a mean age of 52.33 ± 16.17 years. Overall, 12%, 4.31%, 27.6%, and 23.3% of patients reported borderline anxiety, abnormal anxiety, borderline depression, and abnormal depression, respectively.* ***Conclusion:*** *The present study does not provide a statistically significant association between anxiety/depression and hemodialysis; however, anxiety and depression should be investigated among the patients on hemodialysis as these disorders commonly coexist with CKD and ESRD, and they affect the quality of life.*

Keywords: Depression, Anxiety, Hemodialysis, Al-Kharj

Abbreviations: CKD: Chronic Kidney Disease; ESRD: End-Stage Renal Disease; RRT: Renal Replacement Therapy; CBT: Cognitive Behavioral Therapy; HADS: Hospital Anxiety and Depression Scale; KSA: Kingdom of Saudi Arabia

INTRODUCTION

Chronic kidney disease (CKD) is a prevalent and important non-communicable condition that poses a long-term global health burden, affecting 200 million people around the globe [1,2]. CKD contributes to significant cardiovascular morbidity, all-cause mortality and reduced quality of life [3]. CKD is defined as "glomerular filtration rate (GFR) <60 mL/min per 1.73m^2 or markers of kidney damage, or both, of at least 3 months duration" [2]. When GFR decreases to <15 mL/min per 1.73m^2, the condition is called end stage kidney disease (ESKD) or end stage renal disease (ESRD). ESKD or ESRD is the point where kidney function fails to sustain life for a longer time, requiring renal replacement therapy (RRT) in the form of dialysis (i.e. hemodialysis or peritoneal dialysis) or a kidney transplant. According to an estimate, more than 1.5 million people with ESRD are on hemodialysis and more than 1 billion people cannot avail of dialysis, contributing to 1 million deaths annually from ESRD worldwide [1,4]. In America alone, 400,000 people are on hemodialysis [5]. Similarly, 1.72 million Saudis are suffering from CKD, making 6% of their population [6]. In 2016, there has been an estimate of 16315 patients on hemodialysis and 1372 on peritoneal dialysis with the majority of patients being between 26 to 65 years old [7]. The burden of CKD and dialysis is on the rise in the Kingdom of Saudi Arabia (KSA). Particular causes of CKD include diabetes mellitus (DM), hypertension (HTN) and glomerulonephritis (GN).

Anxiety refers to persistent, excessive, and unrealistic worry about everyday events or things such as financial crises, domestic issues, health care problems, and worrying about the future [8]. Anxiety disorders are the most prevalent mental disorders that pose immense healthcare costs and a high burden of disease, affecting 40 million Americans [9]. It affects upto 20% of adults each year. Similarly, anxiety and depressive disorders commonly coexist with CKD. Studies have reported that 21.1% to 53.4% of CKD patients, undergoing pre-dialysis phase or hemodialysis, suffer from anxiety disorder [10]. Social anxiety disorder is prevalent in KSA that contributes to 13% of all neurotic illnesses presented in psychiatric clinics [11]. Anxiety disorders are less studied among the patients suffering from CKD in KSA. One of the studies identified probably and confirmed cases of anxiety as 21% and 23.3% respectively among CKD patients [12].

Depression refers to a condition when an individual feels down or hopeless and takes less interest in daily routine. Globally, depression has been reported to be 22.8% in dialysis patients and 21.4% in pre-dialysis CKD patients [13]. Depressive and anxiety disorders are associated with adverse clinical outcome in patients with CKD [14]. A study conducted in Jeddah (KSA) reported the prevalence of depressive disorder and significant depressive symptoms in 6.8% and 24.2% patients respectively on hemodialysis [15]. However, the prevalence of the depressive disorder is less among the Saudis as compared to rest of the world. Depression among Saudis is distinctly associated with physical health characteristics (such as CKD) and psychosocial issues [15].

As anxiety, depression and related factors are prevalent in patients with CKD or undergoing hemodialysis, they significantly affect the sufferer's quality of life and disease outcome. Thus, management of these psychosocial problems will improve quality of life, reduce economic cost, improving clinical outcome with reduced morbidity and mortality. Anxiety disorders can be managed through effective modifications in lifestyle, psychological therapy, aerobic exercise and drug treatment [16]. Lifestyle modifications can be considered in terms of regular exercise, enhanced deep sleep, improved hygiene, smoking cessation and avoiding caffeine and alcohol. These implications may mitigate the co-morbidity posed by anxiety disorders among CKD patients. A number of psychotherapies (e.g. relaxation and mindfulness therapies, psychodynamic and cognitive therapies) have been developed to alleviate anxiety and depressive disorders. Cognitive behavioral therapy (CBT) is the most effective psychotherapy supported by sufficient evidence. CBT poses a positive effect on the patients undergoing hemodialysis. As far as drug therapy is concerned, benzodiazepines are effective in reducing anxiety in the general population, but they have the potential drug abuse that prohibits their use. However, depressive illness can be managed effectively using antidepressant agents that inhibit serotonin reuptake (SSRIs) or serotonin-norepinephrine reuptake inhibitors (SNRIs).

In KSA, very few studies have been conducted on the topic of interest that provide insufficient evidence to produce sound guidelines to enhance better outcome and healthier life for the patients on hemodialysis. Therefore, this cross-sectional study was carried out to assess anxiety, depression and related influencing factors among CKD and ESRD patients on hemodialysis at dialysis unit of King Khaled and the Military hospital in Al-Kharj city in order to supplement and strengthen existing evidence.

PATIENTS AND METHODS

The primary aim of this study was to investigate and assess the prevalence of anxiety, depressions and related influencing factors amongst CKD and ESRD patients who were receiving hemodialysis. We aimed to support the existing literature with an end to establishing better outcomes for such patients. A secondary aim of this study was to assess relationships, if any, between depression and/or anxiety and other chronic comorbidities such as hypertension and diabetes mellitus.

This cross-sectional study was conducted from December 2016 to January 2017 in the dialysis units of King Khaled and the Military Hospitals in Al-Kharj city. We recruited 144 CKD and ESRD patients on hemodialysis from Al-Kharj city's major hospitals. Using the "Raosoft sample size calculator", we determined that a study population of 105 would be adequately powered, with a 5% margin of error and a 95% confidence interval. We recruited our patients using a stringent set of inclusion and exclusion criteria.

Inclusion Criteria

Patients of both the genders, all ages, patients receiving hemodialysis treatment, provision of legal informed consent were included in the study.

Exclusion Criteria

Patients whose mental capacity was compromised, who could not provide informed consent and minors who failed to provide legal guardian consent were excluded from the study.

A standard self-administered questionnaire-the Hospital Anxiety and Depression Scale (HADS) was used in the study to measure the presence and severity of anxiety and depression in the study population. HADS contains 14 items in total regarding anxiety and depression; each subscale contains 7 items. A scoring system from 0 to 3 is provided for each item, indicating the intensity and frequency of the relevant symptom. The total score, therefore, ranges from 0 to 21 for each subscale indicating the absence, probable presence and likely presence of the disorder as reflected in Table 1.

Table 1 HADS scoring system

Variables	Presence of Disorder
0-7	Absent-Normal
8-10	Probably Present-Borderline Abnormal
11-21	Present-Abnormal

The HADS is available freely on a public domain and is not restrictive. It has been translated to Arabic and back to English and was validated by 2 independent consultant physicians and 1 psychiatrist. We prepared a questionnaire to obtain social and demographic information regarding our participants, as well as to identify any other relevant factors which might show an association with anxiety and/or depression. We maintained strict patient confidentiality and anonymity with regards to handling the data obtained.

The ethical approval for this study was obtained from the Dean of the College of Medicine, as well as the relevant ethics boards and administrative bodies of the hospitals involved in this study. A hard copy of the HADS, as well as the questionnaire, was handed to each patient. Patients, who were precluded from filling out the forms manually due to physical impediments, or lack of literacy, were verbally interviewed. Their responses were recorded and filled out by the interviewer.

The information collected from this study was transferred to a Microsoft Excel spreadsheet. Analysis of the data was done using the SPSS software version 20. Appropriate statistical tests such as the Chi-square test were used to identify associations between relevant factors and anxiety/depression.

RESULTS

Of the 144 patients sampled from the dialysis units of King Khaled and the Military Hospitals in Al-Kharj, we managed to collate results from 116 of them. The mean age of all participants was 52.33 ± 16.17, with the youngest participant being 14 years and the oldest being 94 years. The mean hemodialysis frequency was 2.99 ± 0.268, with a mean duration of 3.54 ± 0.48. Of the 116 respondents, 66 were male and 50 were female; hence the male to female ratio was 1.32: 1. About 62.9% (n=73) of the study sample comprised of young adults between the ages of 20-30 years. About 8.62% (n=10) of the study sample were younger than the age of 20 years, and the remaining 28.4% (n=33) were comprised of individuals above the age of 40 years. These demographic details may be referenced in detail in Table 2.

Table 2 Demographic results

Variables		N (%)
Gender	Male	66 (56.90%)
	Female	50 (43.10%)
Age Group	Less than 30 years	10 (8.62%)
	20-30 years	73 (62.93%)
	Over 40 years	33 (28.45%)
Social Status	Married	92 (79.31%)
	Single	13 (11.21%)
	Divorced	2 (1.72%)
	Widowed	9 (7.76%)

Live with family	Yes	110 (94.83%)
	No	6 (5.17%)
Education	have not studied	38 (32.76%)
	Elementary school	24 (20.69%)
	Middle school	24 (20.69%)
	High school	19 (16.38%)
	College	8 (6.90%)
	Other	3 (2.59%)
Career status	Governmental	24 (20.69%)
	Private Sector	1 (0.86%)
	Private	4 (3.45%)
	No job	48 (41.38%)
	Retired	27 (23.28%)
	Other	12 (10.34%)
Diabetes	Yes	60 (51.72%)
	No	56 (48.28%)
Monthly income	Low	62 (53.45%)
	Average	32 (27.59%)
	High	22 (18.97%)
Hypertension	Yes	94 (81.03%)
	No	22 (18.97%)
Other diseases	Yes	47 (40.52%)
	No	69 (59.48%)
First Session	<1 year	12 (10.34%)
	1-5 years	69 (59.48%)
	5-10 years	20 (17.24%)
	>10 years	15 (12.93%)

As explained in the methodology, we sought to identify any potential social or demographic factors in the patient questionnaire to establish relationships with their anxiety and/or depression. To this end, our questionnaire evaluated the marital status, family habitat, educational level, career status and gross monthly income of the individuals surveyed.

Overall, 12% of patients surveyed reported borderline anxiety, and 4.31% reported abnormal anxiety. About 27.6% reported borderline depression and 23.3% reported abnormal depression. These figures can be referenced in detail in Table 3.

Table 3 HADS anxiety and depression prevalence

Variables	**Anxiety**		**Depression**	
Normal	97	(0.8362)	57	(0.4914)
Borderline	14	(0.1207)	32	(0.2759)
Abnormal	5	(0.0431)	27	(0.2328)

About 76.7% (n=89) of the patients surveyed were married, 11.2% (n=13) were single, 1.7% (n=2) were divorced, and 7.6% (n=9) were widowed. Chi-square analysis showed that marital status was not significantly associated with anxiety or depression. About 94.8% (n=110) of all patients lived with their families, whereas 5.2% (n=6) did not. Chi-square analysis showed that cohabitation with the family was not significantly associated with anxiety. However, it was shown to be significantly associated with depression ($p<0.05$). However, this result must be interpreted with caution, as only 6 patients (5.2%) were not living with their families and all of them reported normal results in the HADS score for depression. As such, more than 20% of cells in the relevant sub-table have cell counts less than 5, and may potentially invalidate the Chi-square results. These figures may be referenced in Table 4.

Table 4 Anxiety results

Variables	**Normal**		**Borderline abnormal**		**Abnormal**		**Chi-square**
	N	**%**	**N**	**%**	**N**	**%**	

Gender	Male	61	52.60%	5	4.30%	0	0.00%	0.005[*,b]
	Female	36	31.00%	9	7.80%	5	4.30%	
Age Group	Less than 30 years	9	7.80%	1	0.90%	0	0.00%	0.529[b,c]
	30-60 years	59	50.90%	9	7.80%	5	4.30%	
	>60 years	29	25.00%	4	3.40%	0	0.00%	
Social Status	Married	77	66.40%	11	9.50%	4	3.40%	0.768[b,c]
	Single	12	10.30%	1	0.90%	0	0.00%	
	Divorced	2	1.70%	2	0.00%	0	0.00%	
	Widowed	6	5.20%	0	1.70%	1	0.90%	
Live with family	Yes	91	78.40%	14	12.10%	5	4.30%	0.538[b,c]
	No	6	5.20%	0	0.00%	0	0.00%	
Education	Have not studied	29	25.00%	7	6.00%	2	1.70%	0.247[b,c]
	Elementary school	22	19.00%	2	1.70%	0	0.00%	
	Middle school	19	16.40%	5	4.30%	0	0.00%	
	High school	17	14.70%	0	0.00%	2	1.70%	
	College	7	6.00%	0	0.00%	1	0.90%	
	Other	3	2.60%	0	0.00%	0	0.00%	
Career status	Governmental	24	20.70%	0	0.00%	0	0.00%	0.122[b,c]
	Private Sector	1	0.90%	0	0.00%	0	0.00%	
	Private	4	3.40%	0	0.00%	0	0.00%	
	No job	37	31.90%	8	6.90%	3	2.60%	
	Retired	24	20.70%	3	2.60%	0	0.00%	
	Other	7	6.00%	3	2.60%	2	1.70%	
Monthly income	Low	50	43.10%	8	6.90%	4	3.45%	0.455[b,c]
	Average	27	23.28%	5	4.31%	0	0.00%	
	High	20	17.24%	1	0.86%	1	0.86%	

*: The Chi-square statistic is significant at the 0.05 level; a: More than 20% of cells in this sub-table have expected cell counts less than 5. Chi-square results may be invalid; b: The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid

About 74.1% (n=86) of patients surveyed had educational levels comprising of middle school and lower, while the remaining 25.9% (n=30) had high school education or higher. Chi-square analysis revealed no statistically significant relationship between educational level and anxiety or depression. About 64.7% (n=75) of patients surveyed were either unemployed or retired, whereas the remaining 35.3% (n=41) of patients were employed. Chi-square analysis revealed no statistically significant relationship between employment level and anxiety or depression. About 53.4% (n=62) of patients had a low monthly income, whereas the remaining 46.6% (n=54) had average to high monthly income. Chi-square analysis revealed no statistically significant relationship between monthly income and anxiety or depression. These figures may be referenced in Table 5.

Table 5 Depression results

Variables		Normal		Borderline abnormal		Abnormal		Chi-square
		N	%	N	%	N	%	
Gender	Male	35	30.20%	15	12.90%	16	13.80%	0.398
	Female	22	19.00%	17	14.70%	11	9.50%	
Age Group	Less than 30 years	5	4.30%	4	3.40%	1	0.90%	0.628[a]
	30-60 years	35	30.20%	18	15.50%	20	17.20%	
	>60 years	17	14.70%	10	8.60%	6	5.20%	
Social Status	Married	46	39.70%	21	18.10%	25	21.60%	0.056[a,b]
	Single	7	6.00%	5	4.30%	1	0.90%	
	Divorced	2	1.70%	0	0.00%	0	0.00%	
	Widowed	2	1.70%	6	5.20%	1	0.90%	
Live with family	Yes	51	44.00%	32	27.60%	27	23.30%	0.038[a,*]
	No	6	5.20%	0	0.00%	0	0.00%	

Education	Have not studied	15	12.90%	13	11.20%	10	8.60%	0.955[a,b]
	Elementary school	14	12.10%	5	4.30%	5	4.30%	
	Middle school	12	10.30%	5	6.00%	5	4.30%	
	High school	10	8.60%	7	4.30%	4	3.40%	
	College	5	4.30%	1	0.90%	2	1.70%	
	Other	1	0.90%	1	0.90%	1	0.90%	
Career status	Governmental	13	11.20%	3	2.60%	8	6.90%	0.240[a,b]
	Private Sector	1	0.90%	0	0.00%	0	0.00%	
	Private	4	3.40%	0	0.00%	0	0.00%	
	No job	21	18.10%	18	15.50%	9	7.80%	
	Retired	13	11.20%	6	5.20%	8	6.90%	
	Other	5	4.30%	5	4.30%	2	1.70%	
Monthly income	Low	35	56.45%	17	27.42%	10	16.13%	0.357
	Average	13	40.63%	9	28.13%	10	31.25%	
	High	9	40.91%	6	27.27%	7	31.82%	

*: The Chi-square statistic is significant at the 0.05 level; a: More than 20% of cells in this sub-table have expected cell counts less than 5. Chi-square results may be invalid; b: The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid

About 51.7% (n=60) of the patients surveyed were diabetic, and 48.3% of them were non-diabetic. Chi-square analysis revealed that the presence of diabetes mellitus was not significantly associated with depression. However, it did show a statistically significant association with anxiety (p=0.044). This result should be interpreted with caution in view of the fact that only 3 (2.59%) and 4 non-diabetic patients (3.45%) reported borderline and abnormal results in HADS scoring system, respectively. Furthermore, only 1 (0.86%) diabetic patient reported an abnormal result in the HADS scoring system.

About 81% (n=94) of the patients surveyed were hypertensive, and 19% of them were non-hypertensive. Chi-square analysis revealed that hypertension was not significantly associated with anxiety. However, it did reveal a statistically significant association with depression (p=0.043).

An analysis was also done on other less prevalent comorbidities, and this is represented by the term "other diseases" in our results stratification. Around 40.5% (n=47) of patients surveyed reported the presence of other diseases. Chi-square analysis revealed no statistically significant associations between the presence of other diseases, with depression or anxiety. These figures may be referenced in Table 6.

Table 6 Association with hypertension and diabetes

Variables		Normal		Borderline abnormal		Abnormal		Chi-square
		N	%	N	%	N	%	
Depression	Diabetic	24	(0.2069%)	18	(15.52%)	18	(15.52%)	0.091
	Non-Diabetic	33	(0.2845%)	14	(12.07%)	9	(7.76%)	
	Hypertensive	41	(0.3534%)	28	(24.14%)	25	(21.55%)	0.043*
	Non-hypertensive	16	(0.1379%)	4	(3.45%)	2	(1.72%)	
	Other diseases	22	(0.1897%)	11	(9.48%)	14	(12.07%)	0.363
	No diseases	35	(0.3017%)	21	(18.10%)	13	(11.21%)	
Anxiety	Diabetic	48	(0.4138%)	11	(9.48%)	1	(0.86%)	0.044*,b
	Non-Diabetic	49	(0.4224%)	3	(2.59%)	4	(3.45%)	
	Hypertensive	77	(0.6638%)	13	(11.21%)	4	(3.45%)	0.485b,c
	Non-hypertensive	20	(0.1724%)	1	(0.86%)	1	(0.86%)	
	Other diseases	37	(0.3190%)	7	(6.03%)	3	(2.59%)	0.464b
	No diseases	60	(0.5172%)	7	(6.03%)	2	(1.72%)	

*: The Chi-square statistic is significant at the 0.05 level; a: More than 20% of cells in this sub-table have expected cell counts less than 5. Chi-square results may be invalid; b: The minimum expected cell count in this sub-table is less than one. Chi-square results may be invalid

DISCUSSION

Anxiety and depression coexist with CKD and ESRD. This study evaluated anxiety, depression and related influencing factors among the patients on hemodialysis, and revealed no significant association with hemodialysis. Although psychiatric disorders are commonly encountered among the patients suffering from CKD or ESRD; however, the present study reported no statistically significant association of these disorders among the patients undergoing hemodialysis. However, this study revealed that the patients on hemodialysis were more depressed than anxious. The present study reported borderline and abnormal anxiety among 12% and 4.31% patients on dialysis, respectively. Similarly, it reported borderline and abnormal depression among 27.6% and 23.3% patients on hemodialysis, respectively. Gender and living with the family were significantly associated with psychiatric problems.

Lilympaki, et al., conducted a cross-sectional study including 258 patients undergoing hemodialysis in Greece in order to determine the effect of perceived social support on anxiety and depression levels [17]. They reported 32.9% and 30.2% of patients with anxiety and depression, respectively. Similarly, Vasilopoulou, et al., reported 47.8% and 38.2% patients on hemodialysis with anxiety and depression, respectively [18]. Turkistani, et al., conducted a cross-sectional study including 286 patients with ESRD in Makkah in order to evaluate the prevalence and predictors of anxiety and depression among the patients on hemodialysis [12]. They reported 21.1% and 23.3% patients with probable anxiety and depression, respectively. Similarly, Al-Shahrani, et al., reported depression among 42% of patients on hemodialysis in the southern region of KSA [19]. These studies by Lilympaki, et al., and Vasilopoulou, et al., show that levels of anxiety and depression among the patients undergoing hemodialysis in Greece are higher than those reported in the present study. However, they reported that high levels of anxiety and depression were associated with low perceived social support. These differences may be attributed to cultural background and social barriers [12].

A number of potential social or demographic factors are involved in the development of psychiatric illnesses among the patients on hemodialysis such as marital status, family habitat, educational level, career status and gross monthly income of the individuals [17]. In this context, the present study only reported significant depression among the patients on hemodialysis who were living with their families. In general, social support from family members reduces anxiety and depression among the patients on hemodialysis [17]. In contrast, the present study reported more depression among the patients undergoing hemodialysis who were living with their families. However, this unusual association may fall a victim to statistical bias, as only 5.2% patients on hemodialysis were not living with their families. Hence, this association needs to be re-evaluated by conducting larger studies in the future. The present study reported no statistically significant association between hemodialysis and educational level or career status or a gross monthly income of the individuals in terms of anxiety and depression.

CONCLUSION

In conclusion, psychiatric disorders such as anxiety and depression should be investigated among the patients on hemodialysis as these disorders commonly coexist with CKD and ESRD and affect the quality of life. Further studies are required to confirm the association between depression and the status of patients on hemodialysis living with their families.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

[1] Ojo, Akinlolu. "Addressing the global burden of chronic kidney disease through clinical and translational research." *Transactions of the American Clinical and Climatological Association,* Vol. 125, 2014, p. 229.

[2] Webster, Angela C., et al. "Chronic kidney disease." *The Lancet,* Vol. 389, No. 10075, 2017, pp. 1238-52.

[3] Hill, Nathan R., et al. "Global prevalence of chronic kidney disease-a systematic review and meta-analysis." *PloS One,* Vol. 11, No. 7, 2016.

[4] Brahmbhatt, Akshaar, et al. "The molecular mechanisms of hemodialysis vascular access failure." *Kidney International,* Vol. 89, No. 2, 2016, pp. 303-16.

[5] Zachara, Bronislaw A. "Selenium and selenium-dependent antioxidants in chronic kidney disease." *Advances in Clinical Chemistry,* Vol. 68, 2015, pp. 131-51.

[6] Cyrus, Cyril, et al. "Assessing known chronic kidney disease associated genetic variants in Saudi Arabian populations." *BMC Nephrology,* Vol. 19, No. 1, 2018, p. 88.

[7] Saudi Center for Organ transplantation. "Annual Report 2016. Hemodialysis in the Kingdom of Saudi Arabia." http://www.scot.gov.sa/images/Annual%20Report%20Dialysis%20Chapter%202016.pdf.

[8] Munir S, Hughes J. "Anxiety, generalized anxiety disorder (GAD)." 2018, https://www.ncbi.nlm.nih.gov/books/NBK441870/

[9] Anxiety and Depression Association America. Facts and Statistics. ADAA, 2018, https://adaa.org/about-adaa/press-room/facts-statistics.

[10] Cantekin, Işın, Mehtap Curcani, and Mehtap Tan. "Determining the anxiety and depression levels of pre-dialysis patients in eastern Turkey." *Renal Failure,* Vol. 36, No. 5, 2014, pp. 678-81.

[11] Ghazwani, Jaafar Y., Shamsun N. Khalil, and Razia A. Ahmed. "Social anxiety disorder in Saudi adolescent boys: Prevalence, subtypes, and parenting style as a risk factor." *Journal of Family and Community Medicine,* Vol. 23, No. 1, 2016, p. 25.

[12] Turkistani, Ibrahim, et al. "The prevalence of anxiety and depression among end-stage renal disease patients on hemodialysis in Saudi Arabia." *Renal Failure,* Vol. 36, No. 10, 2014, pp. 1510-15.

[13] Shafi, Salman T., and Tahir Shafi. "A comparison of anxiety and depression between pre-dialysis chronic kidney disease patients and hemodialysis patients using hospital anxiety and depression scale." *Pakistan Journal of Medical Sciences,* Vol. 33, No. 4, 2017, p. 876.

[14] Loosman, Wim L., et al. "Association of depressive and anxiety symptoms with adverse events in Dutch chronic kidney disease patients: a prospective cohort study." *BMC Nephrology,* Vol. 16, No. 1, 2015, p. 155.

[15] Al Zaben, Faten, et al. "Depression in patients with chronic kidney disease on dialysis in Saudi Arabia." *International Urology and Nephrology,* Vol. 46, No. 12, 2014, pp. 2393-402.

[16] Cohen, Scott D., Daniel Cukor, and Paul L. Kimmel. "Anxiety in patients treated with hemodialysis." *Clinical Journal of the American Society of Nephrology,* 2016.

[17] Lilympaki, Ioanna, et al. "Effect of perceived social support on the levels of anxiety and depression of hemodialysis patients." *Materia Socio-Medica,* Vol. 28, No. 5, 2016, p. 361.

[18] Vasilopoulou, Chrysoula, et al. "The impact of anxiety and depression on the quality of life of hemodialysis patients." *Global Journal of Health Science,* Vol. 8, No. 1, 2016, p. 45.

[19] AlShahrani, Mohammed Abdullah, et al. "Depression and impaired work productivity among hemodialysis patients in south region of Saudi Arabia." *Saudi Journal of Kidney Diseases and Transplantation,* Vol. 29, No. 5, 2018, p. 1133.