

Research Article

# Psychosocial factors among end-stage kidney disease patients receiving hemodialysis treatment in Kumasi, Ghana

Thomas Nti Amoako<sup>1,2\*</sup> and Frances Emily Owusu-Ansah<sup>2</sup>

<sup>1</sup>Department of Mental Health, College of Health and Well-Being, Kintampo, Ghana

<sup>2</sup>Kwame Nkrumah University of Science and Technology, Department of Behavioral Sciences, School of Medical Sciences, Kumasi, Ghana

## Summary

**Background:** End-Stage Kidney Disease and its maintenance hemodialysis treatment force patients to make several lifestyle changes to cope with this debilitating illness. These changes often trigger the onset of notable psychological distress and depressive symptoms. Furthermore, these negative psychological experiences can undermine the effectiveness of the treatment and consequently worsening the health and quality of life of patients.

**Objective:** The study assessed the psychological well-being among hemodialysis patients in Kumasi Metropolis. Further, it explored the relationship between these psychosocial factors and demographic characteristics.

**Materials and Methods:** 30 hemodialysis patients were recruited from two dialysis units in Kumasi, Ghana. Participants were aged 18 and above and had been on hemodialysis treatment for more than three months. The Hospital Anxiety and Depression scale (HADS) was used to assess depression and anxiety whiles the Multidimensional Scale of Perceived Social Support was used to assess perceived social support of participants.

**Results:** The majority of respondents were males (60%), relative to females. The study revealed that 80% were severely depressed, 20% met the criteria for severe anxiety. Some participants reported moderate social support 53.3%; perceived social support being inversely correlated with both depression ( $r = -0.41$ ;  $n = 30$ ;  $p < 0.05$ ) and anxiety ( $r = -0.59$ ;  $n = 30$ ;  $p < 0.05$ ). Income levels were inversely correlated with depression ( $r = -0.41$ ,  $n = 30$ ;  $p < 0.05$ ).

**Conclusion:** Findings of the study suggest that the psychological wellbeing of hemodialysis patients is compromised. Social support appears to alleviate depression and anxiety. Implications for patient treatment are discussed.

## More Information

### \*Address for Correspondence:

Thomas Nti Amoako, Department of Mental Health, College of Health and Well-being, Kintampo, Ghana / Kwame Nkrumah University of Science and Technology, Department of Behavioral Sciences, School of Medical Sciences, Kumasi, Ghana, Tel: +233243038275; Email: tomasnti90@gmail.com

**Submitted:** August 23, 2021

**Approved:** September 06, 2021

**Published:** September 07, 2021

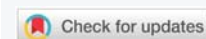
**How to cite this article:** Amoako TN, Owusu-Ansah FE. Psychosocial factors among end-stage kidney disease patients receiving hemodialysis treatment in Kumasi, Ghana. *J Addict Ther Res.* 2021; 5: 014-019.

**DOI:** 10.29328/journal.jatr.1001017

**ORCID:** orcid.org/0000-0001-5008-4407

**Copyright:** © 2021 Amoako TN, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Keywords:** Hemodialysis; Psychological wellbeing; End-stage renal disease; Depression; Anxiety; Social support



## Introduction

End-Stage Kidney Disease (ESKD) is the final stage of chronic kidney disease that is characterized by the complete loss of kidney function persisting over three months [1,23]. Globally the incidence of ESKD is on the increase. For instance, in 2018, ESKD had a prevalence rate of 2204 per million in the U.S. population; in that same year, the number of newly reported ESKD cases were 124,500 [2].

In Africa, ESKD is estimated to affect about 10.4% of some populations [3]. The prevalence of Chronic Kidney Disease (CKD) in sub-Saharan Africa was reported to be

13.9% in a meta-analysis [4]. In Ghana, there seems to be a significant rise in chronic kidney disease at various stages, with an estimated prevalence of 13.3% [5]. At end of the year 2017, there were 686 patients with ESKD receiving renal replacement treatment (RRT) giving the RRT rate of 23.56/per million population (pmp) [5]. One more study reported that the prevalence of CKD was 30% among patients with both diabetes and hypertension in Ghana, making it a significant public health issue [6].

In Ghana, hemodialysis (HD) is the main treatment option as there is no national renal transplantation programme [5].



The ESKD as a disease entity, maintenance dialysis treatment as well as its associated demands have a significant impact on the patients' physical and emotional wellbeing and interfere with the patients' social roles [7].

The diagnosis of ESKD precipitates many emotions, including fear and anger, despair and hope. Life with kidney failure becomes challenging [9]. Patients' physical health, functional status, personal relationships, social and economic prosperity are greatly affected [8]. These experiences show that the psychosocial environment in which ESKD patient lives might affect the course of the disease and the patients' physical well-being [9].

Depression and anxiety have been reported to be the most common psychological conditions among ESKD patients receiving hemodialysis [8]. Depression in renal patients has been associated with a more negative perception of disease [9], poor adherence to dialysis treatment, increase mortality, suicidality [8,21] and a decreased Health-Related Quality of Life (HRQOL) [10].

Anxiety has been associated with decreased HRQOL, primarily in the first few months of HD and in elderly patients<sup>11</sup>. Patients with both depression and anxiety may represent a population at particular risk of high mortality and morbidity. Comorbid depression has been associated with more profound physiological abnormalities and treatment resistance [12].

Therefore, ESKD, which is prevalent in Ghana [5,9], and associated with highly negative psychosocial outcomes in patients treated with HD, needs to be studied using Ghanaian samples to address the negative psychological problems (depression and anxiety). Undesirably, to our best knowledge, these psychosocial variables in most dialysis patients in Ghana are not assessed. Thus, the objective of the current study is to assess the psychological experiences (depression and anxiety) of ESKD patients receiving HD treatment in Kumasi. The study also aimed at exploring how social support is associated with the state of psychological wellbeing of HD patients.

## Methods

### Study design

A cross-sectional study was conducted to assess the psychosocial factors among HD patients in the Kumasi Metropolitan. The psychosocial factors assessed were depression, anxiety, and perceived social support of individuals diagnosed with ESKD and receiving HD treatment within the study centers.

### Study setting

The study was conducted at the dialysis unit of the Komfo Anokye Teaching Hospital (KATH) and Naghe Dialysis Clinic, both in Kumasi, Ghana. KATH is a 1000-bed capacity tertiary medical institution that receives referrals from eight of the

ten regions of the country owing to its strategic location at the confluence of the country's transportation network. Naghe dialysis clinic is also a specialized private dialysis center that attends to patients with ESKD and CKD-related conditions.

As at the time of data collection the dialysis unit at KATH had a population of 22 ESKD patients receiving regular HD treatment while Naghe Clinic had a total of 10 HD patients.

### Sample size

For the current study, researchers used the census sampling method, as the entire population was small. Hence, all patients who met the criterion were approached to participate in the study. Thirty-one patients were eligible for the study and out of that, 30 participants were used for this study as one patient declined participation based on not being interested.

### Sampling methods (Inclusion and exclusion criteria)

Purposive sampling was used to select respondents. Specifically, respondents were recruited based on these criteria: 1) Clinical diagnosis of ESKD (patient's clinical notes were examined to confirmed diagnosis); 2) HD treatment duration not less than 3 months; 3) and aged 18 years and above.

### Research instruments

The following pre-existing self-reported scales were adapted, the Hospital Anxiety and Depression Scale (HADS). HADS was used to assessing anxiety and depression among participants while the Multidimensional Scale of Perceived Social Support (MSPSS) was used to assess perceived social support.

Scores on the HADS range from 0 to 21. A score between 0-7 indicates a normal functioning or sub-clinical range; a score of 8-10 indicates a borderline abnormality and a score ranging from 11-21 indicates abnormal (severity of the condition).

A mean score of the MSPSS was calculated from a total scale to indicate the level of perceived social support. Furthermore, in using the scale response descriptors as a guide, means ranging from 1 to 2.9 could be considered low support; those ranging from 3 to 5 could be considered moderate support, and mean scores within 5.1 to 7 could be considered high support.

A pretesting was conducted at the Cape Coast Teaching Hospital to ascertain the reliability and validity of the adapted scales on a Ghanaian population, hence 10 hemodialysis patients from the Cape Coast Teaching Hospital were used. The reliability was tested scale by scale to ascertain the internal consistency of the items. The results indicated a Cronbach's alpha for HADS as (0.71) and MSPSS as (0.89).

### Statistical analysis

Statistical Package for the Social Sciences (SPSS) version



20 was used to analyze data. The scales were coded. Serial numbers were given to each scale for easy identification. The editing procedure was to check whether respondents had followed directions correctly and answered all questions. Obtained demographics were coded as well. The data was edited after input Categorical variables were analyzed and presented as frequencies and percentages. The continuous variables were presented as means and standard deviations.

The Pearson Correlation Coefficient was used to compute the relationship between depression states, anxiety states, perceived social support, and income levels of participants. The significance level for all analyses was set at a *p* - value less than 0.05, two-tailed.

**Ethical approval**

Ethical approval was obtained from the Committee on Human Research Publication and Ethics (CHRPE) of KATH/ KNUST (CHRPE/RC/83/16); after which the necessary contact with the head of the two dialysis centers was established. Permission was obtained for the administration of the instrument. Informed consent and a participation leaflet, explaining the purpose of the study and assurance of confidentiality and anonymity to respondents, preceded the administration of questionnaires.

**Results**

**Demographic data**

There were a total of 30 participants, 18 (60%) males, and 12 (40%) females. The oldest participants were in their early sixties and the youngest were in their twenties. The age range distribution is shown in table 1. Most of the respondents 22 (73.3%) were married, a few widowed (3, 10.0%), and some single (2, 6.7%) or separated (2, 6.7%).

The majority of the respondents had been on HD treatment between 3-6 months, while some had been on dialysis between 7-12 months. The results also showed that some respondents had hypertension while others were both hypertensive and diabetic. Participants were either retired or working part-time. None was working full time (Table 1).

Half of the respondents, 15 (50.0%) were receiving less than GH 600.00 as monthly income. A few (7, 23.3%) were getting between GH 600-GH 1200 (Table 1).

The Levels of Psychosocial States (Depression, Anxiety and Perceived Social Support).

Table 2 shows the prevalence levels of depression, anxiety, and social support among the study subjects. Findings show that the majority (24, of 30; 80.0%) met the recommended threshold (score ≥ 11) for a possible diagnosis of severe depression on the HADS. The anxiety subscale had 19 (63.3%) out of the 30 respondents being in the normal range on the anxiety scale and 6 (20.0%) respondents meeting the

**Table 1:** Background characteristics of the study participants.

Variable	Frequency	Percentage %
Gender		
Male	18	60
Female	12	40
Age		
20 - 30 years	5	16.7
31 - 40 years	4	13.3
41 - 50 years	6	20.0
51 - 60 years	7	23.3
61 and above	8	26.7
Marital Status		
Single	2	6.7
Married	22	73.3
Divorced	1	3.3
Separated	2	6.7
Widowed	3	10.0
Duration of dialysis		
3 - 6 months	12	40.0
7 - 12 months	9	30.0
1 - 2 years	5	16.7
Above 2 years	4	13.3
Employment status		
Part time	6	20.0
Unemployed,	6	20.0
Retired	9	30.0
Disabled	9	30.0
Income levels		
Less than GH 600	15	50.0
Gh 600 - 1200	7	23.3
Gh 1300 - 2000	6	20.0
Gh 2100 - 4000	1	3.3
Gh 4100 - 7000	1	3.3

**Table 2:** Descriptive Data on Depression, Anxiety and Social support.

Variable	Frequency	Percentage %
Depression		
Normal	2	6.7
Borderline (moderate)	4	13.3
Abnormal (severe)	24	80.0
Anxiety		
Normal	19	63.3
Borderline (moderate)	5	16.7
Abnormal (severe)	6	20.0
Social support		
Low	6	20.0
Moderate	16	53.3
High	8	26.7

recommended threshold (score ≥ 11) for a diagnosis of severe anxiety. On perceived social support, 16 (53.3%) respondents were moderately satisfied with their social support, while, 8 (26.7) of the respondents perceived higher social support.

These results indicate that the majority of the respondents were severely depressed. However, comparatively fewer were thus anxious. Generally, many respondents were somewhat satisfied with the social support they received (Table 2).

Correlation between the Psychological Factors and Income levels of participants.



The study also sought to find the relationships among the psychosocial factors – that is, depression, anxiety, and social support. The results showed that there is a statistically significant negative or inverse correlation between depression and perceived social support score ( $r = -0.41$ ;  $p < 0.05$ ). Persons who reported higher social support were less likely to have a high prevalence of depression; and inversely, those who received less social support were more likely to have a high prevalence of depression.

Similarly, there was a statistically significant negative correlation between anxiety levels and perceived social support score ( $r = -0.59$ ;  $p < 0.05$ ). These results indicated that higher perceived social support was inversely related to anxiety scores among the patients. Here too, the higher perceived social support, the less anxiety was reported.

Examining the relationship of these to income levels, the results showed a significant correlation between income levels and depression ( $r = -0.41$ ,  $p < 0.05$ ), indicating that higher income levels were associated with a decreased prevalence of depression among patients undergoing HD in Ghana. However, the relationship of income to anxiety was insignificant (Table 3).

**Table 3:** Pearson Correlation Matrix of Psychosocial factors.

Variable	Depression	Anxiety
Social support	- 0.41*	- 0.59*
Income levels	- 0.41*	- 0.23

Note: \* $p < .05$  (2 tailed).

## Discussion

This study assessed psychosocial factors among ESKD patients receiving HD treatment in Kumasi, Ghana. We found that the majority of the respondents met the criteria for a diagnosis of severe depression; corroborating previous studies that have found that HD patients go through physical and psychological turmoil such as depression [13,15,20,22].

Among psychosocial factors assessed in this study, the highest impairment was seen in depression as the study results reported that 80% of the patients had a higher (severe) score on the depression subscale of the hospital anxiety and depression scale (HADS). This indicates that generally, end-stage kidney disease patients receiving HD in our study were severely depressed. The results from our study are comparable to a study that used the HADS scale in patients with chronic renal failure [13]. Findings from this study are also consistent with another study that investigated the factors affecting the quality of life of renal failure patients and found a 70% prevalence of depression among dialysis patients using the Beck Depression Inventory (BDI); findings that showed that depression has a significant impact on patients' perception of their quality of life [14].

Albeit previous studies have documented a high prevalence

of depression among HD patients, it should be noted that the present study's prevalence of (80%) for severe depression is among the highest rate so far. The reason for the high prevalence of depression in this sample could be linked to the ESKD as a disease entity and maintenance HD treatment [7,13,14]. It could also be partly linked to the income levels of participants as this perspective is supported by our study reporting a negative correlation between income levels and depression, this assertion is also supported by previous works [19,20]. Several studies have looked into possible social, clinical, and psychological factors associated with depression in ESKD patients. For example, a literature review studying depression in HD patients identified several risk factors for developing depression including gender, sleep quality, employment, and financial status [31].

We, therefore, hold the view that the high cost of the HD treatment in the country coupled with the finding that none of our participants was working full time and some others being laid off because of the ESKD; suggests greater financial dependency in this sample. Patients on average pay between GH 450-GH 550 cedis per week for dialysis treatment (a total cost for 2 sessions in a week). This amount is usually out of the reach of many patients as most of them are unemployed, retired, or laid off because of the ESKD and its treatment modality. Hence, the financial burden of patients could be linked to the prevalence of depression in this sample.

In the current study, a few (6, 20.0%) respondents' scores met the criteria for severe anxiety; a finding that is consistent with the Cukor et al., a study in which a 19.0% to 30.0% prevalence of anxiety was reported among dialysis patients [11]. Several other studies report an increased level of anxiety in HD patients, with most of these studies reporting a prevalence rate ranging from 1% to 45.7% [29,32,33].

Several studies have reported on the negative consequences of depression and anxiety on treatment outcomes of ESKD. Studies have shown that HD patients with a diagnosis of depression have a worse treatment outcome such as higher rates of hospitalization, higher rates of dialysis withdrawal and mortality [25,26], as well as increased usage of the healthcare system [27]. According to Farrokhi, et al, the presence of depressive symptoms is associated with a 50% increase in the risk of mortality [28].

Compared to depression, anxiety has received less attention concerning studying its consequences on clinical outcomes among HD patients. Notwithstanding that, the prevalence of anxiety in patients on HD has been shown to result in a significantly lower quality of life (QoL) than patients with no psychopathology and even lower QoL than patients with only a depressive disorder [29,30]. Given the reported prevalence of depression and anxiety in our study, it can be inferred that our participants are at a greater risk of higher rates of hospitalization, higher inpatient days, higher rates of



dialysis withdrawal, and mortality. Hence, the focus should be on early identification and improvements in the negative psychosocial experiences, including depression and anxiety in ESKD patients receiving HD treatment in Ghana.

Findings from this study revealed that there is a negative correlation between perceived social support and depression. Indicating that our study participants who had high social support from friends, family, and significant others were less likely to have a high prevalence of depression while those with low levels of social support were more likely to have a high prevalence of depression. The finding emphasizes the importance of social support to patients with ESKD for greater satisfaction with life and positive affect [15,16].

Similarly, anxiety was negatively correlated with social support in this study affirming that ESKD patients with more supportive environments are more likely to experience lower levels of anxiety. This too is consistent with previous works [17,18]. These findings suggest that ESKD patients who benefit from good social support resources are likely to display less psychological distress and depressive symptoms. Previous studies have established that there is an association between survival and perceived social support in ESKD patients as high levels of social support have been associated with increased utilization of medical services [15]. According to a study by Mollaoglu, social support and anxiety were significant predictors of self-care after controlling for the effect of time on dialysis [24]. Indicating that patients who perceived higher levels of social support and lower levels of anxiety were more likely to have a higher level of self-care in ESKD patients [24].

Given the observed inverse association between depression, anxiety, and perceived social support in the current study, Health facilities should implement a psychosocial education program to help ESKD patients and their families attain a better understanding of how social support (from family, friends, and significant others) will go a long way in helping patients achieve better treatment outcome.

## Conclusion

End-Stage Kidney Disease is one of the devastating chronic disorders with several public health issues affecting an increasing number of people in Ghana [7]. HD is a life-sustaining treatment for patients with ESKD; however, this treatment modality has been noted to have a detrimental effect on patients' mental status [20]. Progressively, depression is being recognized as a substantial comorbid illness in these patients. Anxiety and impaired HRQOL are also significant interrelated psychological conditions [10-13].

The current study was not without limitations. The subjective nature of self-report scales and the cross-sectional nature of the current study were seen as limitations as the time effects of the study variables were unclear. Notwithstanding, the current study has added to the existing literature on ESKD in Ghana. Given the observed relationship between

depression and income levels, HD treatment should be made more affordable to these patients to reduce the prevalence of depressive symptoms. Social support resources for them cannot be overemphasized as it has an impact on patients' prevalence of psychological distress and depressive symptoms [16,17].

Furthermore, an integrated and holistic approach to treatment that incorporates psychological services, such as counseling, should be provided at the dialysis units for patients and their families to adequately prepare them before dialysis treatment commences. An initial systematic assessment of a patient's mental status would aid better treatment planning that facilitates the provision of continuous psychological support.

## Acknowledgement

We thank the staff and patients of the dialysis unit of the Komfo Anokye Teaching Hospital and Naghe clinic for their contribution to this study.

**Funding:** The authors funded this work.

## References

1. Eknoyan G, Lameire N, Eckardt K, Kasiske B, Wheeler D, et al. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney Int.* 2013; 3: 5-14.
2. U.S. Renal Data System, USRDS Annual data report: atlas of chronic kidney disease and End-Stage Kidney Disease in the United States, National Institute of Diabetes and Digestive and Kidney Diseases. 2018.
3. Afolabi MO, Abioye-Kuteyi AE, Arogundade FA, Bello IS. Prevalence of chronic kidney disease in a Nigerian family practice population. *South African Family Practice.* 2009; 51.
4. Stanifer JW, Jing B, Tolan S, Helmke N, Mukerjee R, et al. The epidemiology of chronic kidney disease in sub-Saharan Africa: a systematic review and meta-analysis. *Lancet Glob Health.* 2014; 2: e174-181. **PubMed:** <https://pubmed.ncbi.nlm.nih.gov/25102850/>
5. Tannor EK, Sarfo FS, Mobula LM, Sarfo-Kantanka O, Adu-Gyamfi R, et al. Prevalence and predictors of chronic kidney disease among Ghanaian patients with hypertension and diabetes mellitus: A multicenter cross-sectional study. *J Clin Hyperten.* 2019; 21: 1542-1550. **PubMed:** <https://pubmed.ncbi.nlm.nih.gov/31465141/>
6. Ephraim RK, Biekpe S, Sakyi SA, Adoba P, Agbodjakey H, et al. Prevalence of chronic kidney disease among the high-risk population in South-Western Ghana; a cross-sectional study. *Can J Kidney Health Dis.* 2015; 2: 40. **PubMed:** <https://pubmed.ncbi.nlm.nih.gov/26535132/>
7. Saban KL, Stroupe KT, Bryant FB, Reda DJ, Browning MM, et al. Comparison of health-related quality of life measures for chronic renal failure: quality of well-being scale, short-form6D, and the kidney disease quality of life instrument. *Quality of Life Res.* 2008; 17: 1103-1015. **PubMed:** <https://pubmed.ncbi.nlm.nih.gov/18791810/>
8. Sohn BK, Oh YK, Choi JS, Song J, Lim A, et al. Effectiveness of group cognitive behavioral therapy with mindfulness in end-stage renal disease hemodialysis patients. *Kidney Res Clin Pract.* 2018; 37: 77-84. **PubMed:** <https://pubmed.ncbi.nlm.nih.gov/29629280/>
9. Kimmel PL. Psychosocial factors in dialysis patients. *Kidney Int.* 2001; 59: 599-613. **PubMed:** <https://pubmed.ncbi.nlm.nih.gov/11260433/>
10. Patel SS, Shah VS, Peterson RA, Kimmel PL. Psychosocial variables,



- quality of life, and religious beliefs in ESRD patients treated with hemodialysis. *Ame J Kidney Dis.* 2002; 40: 1013-1022.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/12407647/>
11. Cukor D, Cohen SD, Peterson RA, Kimmel PL. Psychosocial aspects of chronic disease: ESRD as a paradigmatic illness. *J Am Soc Nephrol.* 2007; 18: 3042-3055.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/18003775/>
  12. Msc RN, Babatsikou FP. Social aspects of chronic renal failure in patients undergoing hemodialysis. *Int J Caring Sci.* 2014; 7: 740.
  13. Montilla P, Perales-Montilla CM, García León A, García-León A, Reyes del Paso GA, et al. Psychosocial predictors of the quality of life of chronic renal failure patients undergoing hemodialysis. *Nefrología.* 2012; 32: 622-630.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/23013948/>
  14. Jofre R, Lopez-Gomez JM, Valderrabano F. Quality of life for patient groups. *Kidney Int.* 2000; 57: 121-130.  
<https://www.sciencedirect.com/science/article/pii/S0085253815470528>
  15. Gerogianni SK, Babatsikou FP. Psychological aspects in chronic renal failure. *Health Sci J.* 2014; 8: 205.
  16. Patel SS, Peterson RA, Kimmel PL. Psychosocial factors in patients with chronic kidney disease: The impact of social support on end stage renal disease. *Semin Dial.* 2005; 18: 98-102.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/15771652/>
  17. Mollaoglu M. Perceived social support, anxiety, and self care among patients receiving hemodialysis. *Dial Transplan.* 2006; 35: 144-155.
  18. Christensen AJ, Ehlers SL. Psychological factors in end-stage renal disease: an emerging context for behavioral medicine research. *J Consult Clin Psychol.* 2002; 70: 712-724.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/12090378/>
  19. Lee YJ, Kim MS, Cho S, Kim SR. Association of depression and anxiety with reduced quality of life in patients with predialysis chronic kidney disease. *Int J Clin Pract.* 2013; 67: 363-368.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/23521328/>
  20. Ganu VJ, Boima V, Adjei DN, Yendork JS, Dey ID, et al. Depression and quality of life in patients on long term hemodialysis at a national hospital in Ghana: a cross-sectional study. *Ghana Med J.* 2018; 52: 22-28.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/30013257/>
  21. O'Callaghan C. *The renal system at a glance.* John Wiley & Sons; 2016.
  22. Amira O. Prevalence of symptoms of depression among patients with chronic kidney disease. *Niger J Clin Practice.* 2011; 14: 460-463.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/22248950/>
  23. Levey AS, Eckardt KU, Tsukamoto Y, Levin A, Coresh J, et al. Definition and classification of chronic kidney disease: a position statement from Kidney Disease: Improving Global Outcomes (KDIGO). *Kidney Int.* 2005; 67: 2089-2100.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/15882252/>
  24. Mollaoglu M. Perceived social support, anxiety, and self care among patients receiving hemodialysis. *Dial Transplant.* 2006; 35: 144-155.
  25. Hedayati SS, Minhajuddin AT, Toto RD, Morris DW, Rush AJ. Prevalence of major depressive episode in CKD. *Am J Kidney Dis.* 2009; 54: 424-432.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/19493599/>
  26. Hedayati SS, Bosworth HB, Briley LP, Sloane RJ, Pieper CF, et al. Death or hospitalization of patients on chronic hemodialysis is associated with a physician-based diagnosis of depression. *Kidney Int.* 2008; 74: 930-936.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/18580856/>
  27. Tavallai SA, Ebrahimia M, Shamspour N, Assari S. Effect of depression on health care utilization in patients with the end-stage renal disease treated with hemodialysis. *European J Int Med.* 2009; 20: 411-414.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/19524185/>
  28. Farrokhi F, Abedi N, Beyene J, Kurdyak P, Jassal SV. Association between depression and mortality in patients receiving long-term dialysis: a systematic review and meta-analysis. *Am J Kidney Dis.* 2014; 63: 623-635.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/24183836/>
  29. Cukor D, Coplan J, Brown C, Friedman S, Cromwell-Smith A, et al. Depression and anxiety in urban hemodialysis patients. *Clin J Am Soc Nephrol.* 2007; 2: 484-490.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/17699455/>
  30. Cukor D, Ver Halen N, Fruchter Y. Anxiety and quality of life in ESRD. *Semin Dial.* 2013; 26: 265-268.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/23432416/>
  31. Veater NL, East L. Exploring depression amongst kidney transplant recipients: a literature review. *J Renal Care.* 2016; 42: 172-184.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/27220908/>
  32. Preljevic VT, Østhus TB, Sandvik L, Bringager CB, Opjordsmoen S, et al. Psychiatric disorders, body mass index and C-reactive protein in dialysis patients. *Gen Hosp Psychiatry.* 2011; 33: 454-461.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/21831445/>
  33. Murtagh FE, Addington-Hall J, Higginson IJ. The prevalence of symptoms in end-stage renal disease: a systematic review. *Adv Chronic Kidney Dis.* 2007; 14: 82-99.  
**PubMed:** <https://pubmed.ncbi.nlm.nih.gov/17200048/>