Turkish Journal of Geriatrics
2017;20 (3):204-212

- Bilge KESİKBURUN[1]
- Emel EKŞİOĞLU[1]
- İbrahim AKDAĞ[2]
- Aytül ÇAKCI[1]

RESEARCH

DETERMINANTS OF HEALTH-RELATED QUALITY OF LIFE IN ELDERLY HEMODIALYSIS PATIENTS

Abstract

Introduction: Very limited data about the quality of life in elderly hemodialysis patients are available. The aim of this study was to identify clinical and demographic determinants that influence health-related quality of life in elderly hemodialysis patients.

Materials and Method: In total, 94 hemodialysis patients participated in the study. The participants were divided into two groups according to age: elder group (age of ≥60 years) and younger group (age of<60 years). Demographic and clinical data including age; gender; marital status; education period; duration of hemodialysis; comorbidity; and serum levels of hemoglobin, albumin, parathyroid hormone, aspartate transaminase, alanine transaminase, calcium, phosphate , urea, and creatinine were recorded. Health-related quality of life was measured using Nottingham Health Profile. Depression was evaluated using Beck Depression Inventory. Comparison of the data was performed between the groups. Determinants for quality of life were identified using multiple logistic regression analysis.

Results: Elderly hemodialysis patients (n=39) had significantly higher scores in energy, pain, and physical activity domains than controls (n=55; p=0.008, p=0.016, p=0.042, respectively). In elderly hemodialysis patients, Beck Depression Inventory was significantly associated with the six domains of Nottingham Health Profile, excluding energy domain (p<0.05). Quality of life was significantly affected by factors including serum levels of hemoglobin, albumin and phosphate ; being married and number of comorbidities (p<0.05). The primary determinant of quality of life in elderly hemodialysis patients seems to be depression.

Conclusion: Quality of life in elderly hemodialysis patients is largely influenced by depression, some metabolic parameters, and number of comorbidities.

Key Words: Aged; Renal Dialysis; Quality of life; Depression

Correspondance

Bilge KESİKBURUN
Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Physical Medicine and Rehabilitation, ANKARA

Phone: 05055847706
e-mail: drbilgekb@gmail.com

Received: 15/04/2017
Accepted: 20/07/2017

[1] Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Physical Medicine and Rehabilitation
ANKARA
[2] Dışkapı Yıldırım Beyazıt Training and Research Hospital, Department of Nephrology
Ankara

ARAŞTIRMA

YAŞLI HEMODİYALİZ HASTALARINDA SAĞLIKLA İLİŞKİLİ YAŞAM KALİTESİNİN BELİRLEYİCİLERİ

Öz

Giriş: Yaşlı hemodiyaliz hastalarında yaşam kalitesi hakkında çok sınırlı veri bulunmaktadır. Bu çalışmanın amacı yaşlı hemodiyaliz hastalarında yaşam kalitesini etkileyen demografik ve klinik belirleyicileri tanımlamaktır.

Gereç ve Yöntem: Çalışmaya toplam 94 hemodiyaliz hastası katıldı. Katılımcılar yaşa göre iki gruba ayrıldı: yaşlı grubu (yaş ≥60) ve genç grubu (yaş<60). Yaş, cinsiyet, medeni durum, eğitim düzeyi, hemodiyaliz süresi, komorbidite, serum hemoglobin, albumin, paratiroid hormon, aspartat transaminaz, alanin transaminaz, kalsiyum, fosfat, üre ve kreatinini içeren klinik ve demografik veriler kaydedildi. Sağlıkla ilişkili yaşam kalitesi Nottingham Sağlık Profili kullanılarak ölçüldü. Beck Depresyon Envanteri kullanılarak depresyon değerlendirildi. Gruplar arasında verilerin karşılaştırılması yapıldı. Yaşam kalitesi için belirleyiciler çoklu lojistik regresyon analizi kullanılarak belirlendi.

Bulgular: Yaşlı hemodiyaliz hastaları (n=39) anlamlı olarak enerji, ağrı ve fiziksel aktivite alanlarında kontrol grubundan daha yüksek skorlara sahipti. (n=55; p=0.008, p=0.016, p=0.042, sırasıyla). Yaşlı hemodiyaliz hastalarında, Beck Depresyon Envanteri Nottingham Sağlık Profili'nin enerji alanı dışındaki altı alanıyla istatistiksel olarak anlamlı derecede ilişkili bulundu (p<0.05). Yaşam kalitesi serum hemoglobin, albumin ve fosfat düzeyinden, evli olmak ve komorbidite sayısını içeren faktörlerden anlamlı olarak etkilenmekteydi (p<0.05). Yaşlı hemodiyaliz hastalarında yaşam kalitesinin primer belirleyicisi depresyon olarak görünmektedir.

Sonuç: Yaşlı hemodiyaliz hastalarında yaşam kalitesi, büyük oranda depresyon, bazı metabolik parametreler ve komorbidite sayısından etkilenmektedir.

Anahtar Sözcükler: Yaşlı; Renal diyaliz; Yaşam Kalitesi; Depresyon

INTRODUCTION

Prevalence of chronic kidney disease in elderly patients is increasing worldwide. Chronic kidney disease is associated with physical, emotional, psychological, and economic sequelae that affect not only the patients but also their families and the society. Majority of the chronic kidney disease patients undergo some form of renal replacement therapy such as renal transplant, hemodialysis, or peritoneal dialysis. Although hemodialysis is a life-saving therapy that increases survival of patients with chronic kidney disease, hemodialysis negatively affects the patients' independent living, psychosocial and mental status, and social life (1).

Older people often have multiple health problems. In addition, this population are more vulnerable to depression than the general population (2). Following hemodialysis treatment, an older patient with preexisting multiple comorbidities and limited physiological reserves is challenged by the new medical condition. The presence of chronic disease and depression are closely associated with poor quality of life in elderly population (3). Additionally, metabolic and nutritional factors including body mass index and serum levels of albumin and hemoglobin are linked with poor quality of life and mortality in hemodialysis patients (4).

Although many studies have investigated the quality of life in hemodialysis patients, information about the quality of life, specifically in elderly hemodialysis patients, is limited. Turkmen et al (5) studied the factors associated with quality of life in elderly population with end-stage renal disease and revealed that depression and sleep quality were predictors for quality of life. Given the susceptibility of this population, much more studies are required to provide a proper healthcare. The aim of this study was to assess the clinical and demographic determinants of health-related quality of life in elderly hemodialysis patients.

MATERIALS AND METHOD

Study Design and Participants

This cross-sectional study was conducted at the dialysis department of -between January 2016 and December 2016. The hemodialysis patients recruited to the study were treated regularly (three times a week) in hemodialysis unit of a single tertiary hospital. All patients (n=120) who were regularly treated at this unit were reviewed according to study criteria.. In total, 94 hemodialysis patients were enrolled for the study. Inclusion criteria were as follows: 1) undergoing hemodialysis at least thrice a week for >3 months and 2) being able to read and understand the questionnaire. Patients who had cognitive impairment and uncontrolled systemic diseases were excluded from the study. The participants were divided into two groups according to age: elder group (age of ≥60 years) and younger group (age of<60 years). Comparison of the groups was performed in terms of demographic data, metabolic function, health-related quality of life, and depression level. Determinants of the health-related quality of life in older patients were assessed.

The study protocol was approved by the local research ethics committee. The study adhered to the guidelines of the Declaration of Helsinki and informed consent was obtained from all the participants.

Assessment Tools

Health-related quality of life was assessed using the Nottingham Health Profile (NHP). NHP is a questionnaire designed to measure the

social and personal effects of an illness. It has six categories comprising 38 items: NHP-energy, NHP-pain, NHP-emotional reaction, NHP-sleep, NHP-social isolations (SI), and NHP-physical mobility (PM). The scores of each component are weighted and range from 0 (no problems) to 100 (maximum problems). The respondent answers "yes" if the statement adequately reflects the current status or feeling, or "no" if otherwise. Turkish adaptation of the NHP has been performed (6).

The severity of depression was assessed using Beck Depression Inventory (BDI), which is a 21-item self-report scale, developed by Beck et al. (7). Items in the scale are rated from 0 to 3 in the increasing order of severity. Item scores are totaled and can range from 0 to 63. Higher scores correlate with more severe depression. The validity and reliability of the Turkish version of the BDI has been established (8). The BDI score of 17 or higher was considered as the cutoff value for the diagnosis of depression.

The abovementioned two assessment tools were applied by the same investigator, together with a questionnaire to obtain the demographic and clinical data and laboratory tests including age; gender; marital status; smoking; education period; duration of hemodialysis; and serum levels of hemoglobin, albumin, parathyroid hormone, aspartate transaminase, alanine transaminase, calcium, phosphate, urea, and creatinine.

Statistical Analysis

Data are presented as mean±standard deviation and proportions for continuous and categorical variables, respectively. Chi-square test was applied for comparison of proportions. The Student's t-test was used to compare the mean values of continuous variables. If the distribution of the continuous variables was not normal, the Mann–Whitney test was used. First, univariate analysis was utilized between each predictor and NHP subscales to identify the variables that were included in the multivariate model. The variables with a p value of<0.20 in univariate analysis that were individually identified as significant predictors, were entered into the multivariate model. Multiple linear regression analysis was conducted to identify the factors that significantly influenced NHP subscales. No more than 4 variables were entered into the multivariate model per NHP subscales. The stepwise method was used to compare the influence of different factors and their types on NHP subscales. Bivariate correlations were analyzed using Pearson correlation coefficients to identify related variables. Collinearity of predictors was considered, and the predictor variables that closely correlated were excluded from the regression analyses. The level of significance was set at a p value of<0.05 (two-tailed). SPSS for Mac, Version 20.0 (SPSS, Chicago, IL) was used to conduct the statistical analyses.

RESULTS

In total, 39 subjects with a mean age of 71±8.0 years and 55 controls with a mean age of 43.9±11.0 years participated in the study. Elderly hemodialysis patients had higher body mass index values and shorter education period compared with controls (p=0.001 and p<0.001, respectively). Cardiac disease and diabetes mellitus were more frequent in elderly patients (p=0.032 and p=0.049, respectively). Hemoglobin levels were lower in elderly hemodialysis patients than in controls (p=0.020). Furthermore, there were significant differences in other demographic and clinical characteristics between the groups (Table 1).

Table 1. Characteristics of elderly hemodialysis patients and controls.

Characteristics	Elderly hemodialysis patients (age ≥60 years) (n=39)	Controls (age 18-59 years) (n=55)	*p*
Age (years)*	71.0±8.0	43.9±11.0	**<0.001**
Gender (female/male)	26/13	25/30	0.059
BMI (kg/cm²)*	26.3±3.6	23.6±3.6	**0.001**
Marital status (married/not married)	21/18	31/24	0.809
Education period (years)*	2.2±2.9	5.3±3.7	**<0.001**
Duration of hemodialysis (years)*	5.7±5.2	7.6±6.7	0.158
Comorbidities			
Arterial hypertension	25 (64.1%)	32 (58.2%)	0.563
Diabetes Mellitus	15 (38.5%)	11 (20.0%)	**0.049**
Cardiac Disease	12 (30.8%)	7 (12.7%)	**0.032**
Cerebrovascular Disease	2 (5.1%)	2 (3.6%)	0.724
Number of comorbidities*	1.4±1.0	1.0±0.9	0.077
Laboratory Tests*			
Hemoglobin, g/dL	10.3±1.1	11.0±1.6	**0.020**
Creatinine, mg/dL	6.1±1.5	6.6±2.1	0.191
Albumin, mg/dL	3.7±0.3	3.7±0.5	0.392
Calcium, mg/dL	8.6±0.6	8.5±0.9	0.531
Phosphate, mg/dL	5.2±1.2	5.2±1.6	0.953
PTH, pg/mL	391.6±365.0	578.4±572.7	0.057
ALT, U/L	13.3±10.4	13.6±7.3	0.891
Beck Depression Inventory*	13.4±14.6	14.4±12.4	0.732

* Mean±standard deviation.
BMI, Body Mass Index; PTH, Parathormone; ALT, Alanine aminotransferase.

Table 2 shows the comparison of averages for the six domains of NHP between the groups. Elderly hemodialysis patients had significantly poorer scores in energy, pain, and physical activity domains of NHP compared with controls (p=0.008, p=0.016, and p=0.042, respectively).

While identifying predictors for the NHP domains in elderly hemodialysis patients, the multiple linear regression analysis showed that Beck depression scores had a positive relationship with five domains including pain, emotional reaction, social isolation, sleep, and physical activity. Serum levels of hemoglobin and albumin showed an inverse relationship with the energy domain (p<0.05). Additionally, serum level of albumin also showed an inverse relationship with physical activity (p<0.05).

The number of comorbidities positively correlated with pain domain and physical activity ($p<0.05$). Phosphate level showed a negative relationship with the sleep domain ($p<0.05$). Being married had a negative relationship with social isolation ($p<0.05$). Table 3 shows how each NHP domain was significantly associated with the variables.

Table 2. Comparison of mean scores* in Nottingham Health Profile subscales between elderly hemodialysis patients and controls.

Characteristics	Elderly hemodialysis patients (age ≥60 years) (n=39)	Controls (age 18-59 years) (n=55)	*p*
Energy	82.0±34.9	59.3±45.6	**0.008**
Pain	40.3±37.4	22.7±31.8	**0.016**
Emotional Reaction	33.5±34.8	39.9±29.3	0.340
Sleep	50.2±40.7	41.8±41.3	0.329
Socialization	16.8±26.5	22.5±32.8	0.357
Physical Activity	42.3±40.6	26.5±33.0	**0.042**

*Mean±standard deviation.

Table 3. Multiple linear regression analysis of the factors that influence the Nottingham Health Profile subscales in elderly hemodialysis patients.

Subscales	Variables	*p*	β	R^2
Energy	Hemoglobin	0.050	-8.982	0.377
	Albumin	0.054	-27.987	
Pain	Beck Depression Inventory	**<0.001**	1.529	0.529
	Number of comorbidities	**0.032**	9.179	
Emotional reaction	Beck Depression Inventory	**<0.001**	1.562	0.430
Sleep	Beck Depression Inventory	**0.001**	1.410	0.348
	Phosphate	**0.023**	-10.396	
Socialization	Beck Depression Inventory	**0.007**	0.673	0.477
	Being married	**0.001**	-23.496	
Physical activity	Beck Depression Inventory	**<0.001**	1.645	0.688
	Number of comorbidities	**0.010**	10.460	
	Albumin	**0.028**	-26.762	

DISCUSSION

This study assessed the health-related quality of life in elderly hemodialysis patients. Pain, energy, and physical activity domains of NHP were found to be poorer in elderly hemodialysis patients than in controls. The results showed that the primary determinant of quality of life in elderly hemodialysis patients seems to be depression, which was associated with all of the NHP domains, excluding energy domain. The metabolic parameters including serum levels of albumin, hemoglobin and phosphate; number of comorbidities and being married were among the other major factors affecting health-related quality of life in hemodialysis patients.

The present study revealed that elderly hemodialysis patients had poorer quality of life in pain, energy, and physical activity domains of NHP. Similar to the present study, Deoreo (9) found that physical function domain of quality of life was lower than the general population. The present findings, which were consistent with the results in the study, showed that pain domain was higher in elderly hemodialysis patients. (5,10-11). This population has to deal with several comorbidities and suffers musculoskeletal problems. So the pain is an important contributory factor in their quality of life. To boost quality of life in elderly hemodialysis patients, clinicians may consider resource of pain and comorbidities.

Depression is a well-known issue that is related with the quality of life. Several previous studies have demonstrated the importance of depression in the quality of life of hemodialysis patients (12,13). In this study, depression was found to be one of the most important determinants for NHP that affected five domains, including pain, social isolation, emotional reaction, sleep, and physical activity. Similarly, Kao et al (14) showed that depression scores were significantly and strongly inversely associated with all the domains of quality of life. High depression scores seemed to exert a major impact on the quality of life in elderly hemodialysis patients. So, early diagnosis and (associated factor)treatment strategies focusing on depression may improve the quality of life in elderly hemodialysis patients.

The present study showed that the presence of comorbidities was associated with the pain domain of quality of life in elderly hemodialysis patients. Similar to our results, several earlier studies described a negative correlation between comorbidities and quality of life in general hemodialysis patients (15,16). However, Wan et al. did not find a correlation between the number of comorbidities and quality of life (1). Multi-morbidity is more commonly seen in elderly population. As a result, elderly hemodialysis patients may be more prone to suffer from pain frequently.

Association between the metabolic profile and health-related quality of life in hemodialysis patients has been investigated in the previous studies. Feroze et al. (4) found that low serum levels of albumin was associated with worse health-related quality of life. In line with this finding, we also found that the serum levels of hemoglobin and albumin had negative relationship with the energy domain of health-related quality of life. In the study of Evans et al. (17), improvement in hematological parameters of anemic hemodialysis patients was significantly associated with better quality of life parameters, including energy, health status, well-being, and psychological state. The elderly population have metabolic imbalance, more frequently. Therefore, metabolic parameters should be carefully considered for increasing the

quality of life in elderly hemodialysis patients by multidisciplinary team approach.

Poor sleep quality is frequently observed in hemodialysis patients and it has been shown to be related with advanced age, depression, cardiac diseases, and poor quality of life (18). Additionally, Kutner et al. (19) showed that elderly hemodialysis population is prone to poor sleep quality, which is related to their psychological state. According to the present findings, depression is related with worse sleep domain score of NHP. It means that depression has also impact on quality of life by means of impairing sleep quality. The present study also showed that phosphate level correlated positively with the sleep domain of quality of life. Relation between sleep quality and phosphate level was also determined in an earlier study by Emami Zeydi et al. (20). They demonstrated that higher phosphate level correlated with sleep quality in the end-stage renal disease population. Higher phosphate level may be related with pruritus. As a result, poor sleep quality and quality of life may be seen in elderly hemodialysis population. In this population, preventing hyperphosphatemia and efficient depression treatment may result in an increase in the sleep quality and quality of life.

Some studies have shown significantly impaired physical function in dialysis patients compared with general population. Anemia, changes in protein catabolism, inflammatory state, and a decrease in protein synthesis may potentially cause decreased physical function (21). Increased serum level of albumin was found to be associated with better physical activity in the present study. Physical function was lower in hemodialysis patients, along with increased risks for comorbidities such as diabetes mellitus, coronary artery disease, stroke, and vascular disease (22). In agreement with this finding, the study revealed that higher number of comorbidities were related with poorer physical activity domain of NHP in elderly hemodialysis patients. In this population, a multidisciplinary approach with close monitoring is needed for the evaluation of disease situation. Metabolic profile does not explain all disease burden and mental well-being. However, metabolic profile such as albumin, hemoglobin are independent variables on quality of life. To attain high quality of life in elderly hemodialysis patients, metabolic profile may be taken into consideration in the treatment algorithms.

In comparison with general population, socialization is affected in hemodialysis patients (23). In the present study, it was found that the social isolation domain of NHP had a negative correlation with being married. In parallel to the present study, Sağduyu et al (24) showed that being married was found to be a positive factor for the quality of life. However, in most of the previous studies (25), marital status was not associated with quality of life. .

There were some limitations in the present study. First, the health-related quality of life was assessed using a generic measure. NHP might not be sufficiently sensitive for hemodialysis patients. In future studies, disease specific measures may help in evaluating the quality of life of this population. Second, the study sample was small, thus limiting the statistical ability to determine significant correlations. Finally, this study was cross-sectional and did not have a healthy control group.

In conclusion, the results of this study indicate that the quality of life in elderly hemodialysis patients is largely influenced by depression, some metabolic parameters, and the number of comorbidities. Clinicians should consider these factors to improve their quality of life.

REFERENCES

1. Wan EY, Chen JY, Choi EP, et al. Patterns of health-related quality of life and associated factors in Chinese patients undergoing haemodialysis. Health Qual Life Outcomes 2015;29;13:108. (PMID:26215978)
2. Prince MJ, Beekman AT, Deeg DJ et al. Depression symptoms in late life assessed using the EURO-D scale Effect of age, gender and marital status in 14 European centres. Br J Psychiatry 1999;174:339-45. (PMID:10533553).
3. Chang-Quan H, Xue-Mei Z, Bi-Rong D, Zhen-Chan L, Ji-Rong Y, Qing-Xiu L. Health status and risk for depression among the elderly: a meta-analysis of published literature. Age Ageing 2010 ;39(1):23-30. (PMID:19903775).
4. Feroze U, Noori N, Kovesdy CP, et al. Quality-of-life and mortality in hemodialysis patients: roles of race and nutritional status. Clin J Am Soc Nephrol 2011;6(5):1100-11. (PMID:21527646).
5. Turkmen K, Erdur FM, Guney I, et al. Sleep quality, depression, and quality of life in elderly hemodialysis patients. Int J Nephrol Renovasc Dis 2012;5:135-42. (PMID:23091392).
6. Kücükdeveci AA, McKenna SP, Kutlay S, Gürsel Y, Whalley D, Arasil T. The development and psychometric assessment of the Turkish version of the Nottingham Health Profile. Int J Rehabil Res 2000 ;23(1):31-8. (PMID:10826123).
7. Beck At, Ward Ch, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561-71. (PMID:13688369).
8. Hisli N. The validity and reliability of Beck depression inventory in university students. Türk Psikoloji Dergisi 1989;7: 3-13. (in Turkish).
9. DeOreo PB. Hemodialysis patient-assessed functional health status predicts continued survival, hospitalization, and dialysis-attendance compliance. Am J Kidney Dis 1997;30(2):204-12. (PMID:9261030).
10. Kim H, An JN, Kim DK, et al; CRC for ESRD Investigators. Elderly Peritoneal Dialysis Compared with Elderly Hemodialysis Patients and Younger Peritoneal Dialysis Patients: Competing Risk Analysis of a Korean Prospective Cohort Study. PLoS One 2015;29;10(6):e0131393. (PMID:26121574).
11. Ramos EC, Santos Ida S, Zanini Rde V, Ramos JM. Quality of life of chronic renal patients in peritoneal dialysis and hemodialysis. J Bras Nefrol 2015;37(3):297-305. (PMID:26398639).
12. Vasilopoulou C, Bourtsi E, Giaple S, Koutelekos I, Theofilou P, Polikandrioti M. The Impact of Anxiety and Depression on the Quality of Life of Hemodialysis Patients. Glob J Health Sci 2015;17;8(1):45-55. (PMID:26234986).
13. Teles F, Azevedo VF, Miranda CT, Miranda MP, Teixeira Mdo C, Elias RM. Depression in hemodialysis patients: the role of dialysis shift. Clinics (Sao Paulo) 2014;69(3):198-202. (PMID:24626947).
14. Kao TW, Lai MS, Tsai TJ, Jan CF, Chie WC, Chen WY. Economic, social, and psychological factors associated with health-related quality of life of chronic hemodialysis patients in northern Taiwan: a multicenter study. Artif Organs 2009;33(1):61-8. (PMID:19178442).
15. Julius M, Hawthorne VM, Carpentier-Alting P, Kneisley J, Wolfe RA, Port FK. Independence in activities of daily living for end-stage renal disease patients: biomedical and demographic correlates. Am J Kidney Dis 1989;13(1):61-9. (PMID:2643311).
16. Vázquez I, Valderrábano F, Jofré R,et al; Spanish Cooperative Renal Patients Quality of Life Study Group.Psychosocial factors and quality of life in young hemodialysis patients with low comorbidity. J Nephrol 2003;16(6):886-94. (PMID:14736017).
17. Evans RW, Rader B, Manninen DL. The quality of life of hemodialysis recipients treated with recombinant human erythropoietin. Cooperative Multicenter EPO Clinical Trial Group. JAMA 1990 ;9;263(6):825-30. (PMID:2404150).
18. Guney I, Atalay H, Solak Y,et al. Predictors of sleep quality in hemodialysis patients. Int J Artif Organs 2010;33(3):154-60. (PMID:20383859).
19. Kutner NG, Bliwise DL, Brogan D, Zhang R. Race and restless sleep complaint in older chronic dialysis patients and nondialysis community controls. J Gerontol B Psychol Sci Soc Sci 2001;56(3):170-5. (PMID:11316835).
20. Emami Zeydi A, Jannati Y, Darvishi Khezri H, et al. Sleep quality and its correlation with serum C-reactive protein level in hemodialysis patients. Saudi J Kidney Dis Transpl 2014;25(4):750-5. (PMID:24969183).

21. Kuo YT, Chiu KM, Tsang YM, Chiu CM, Chien MY. Influence of chronic kidney disease on physical function and quality of life in patients after coronary artery bypass grafting. Cardiorenal Med 2015;5(4):237-45. (PMID:26648940).

22. Guerini Rocco D, Mercieri A, Yavuzer G. Multidimensional health-status assessment of chronic hemodialysis patients: the impact on quality of life. Eura Medicophys 2006;42(2):113-9. (PMID:16767062).

23. Purnell TS, Auguste P, Crews DC, et al. Comparison of life participation activities among adults treated by hemodialysis, peritoneal dialysis, and kidney transplantation: a systematic review. Am J Kidney Dis 2013;62(5):953-73. (PMID:23725972).

24. Sağduyu A, Sentürk VH, Sezer S, Emiroğlu R, Ozel S. Psychiatric problems, life quality and compliance in patients treated with haemodialysis and renal transplantation. Turk Psikiyatri Derg 2006 ;17(1):22-31. (PubMed PMID:16528633).

25. Braga SF, Peixoto SV, Gomes IC, Acúrcio Fde A, Andrade EI, Cherchiglia ML.Factors associated with health-related quality of life in elderly patients on hemodialysis. Rev Saude Publica. 2011;45(6):1127-36. English, Portuguese. (PMID:22124742).