ANKARA MEDICAL JOURNAL

Research Article

Ankara Med J, 2023;(4):428-440 // 10.5505/amj.2023.17092

COMPARISON OF HEALTH-RELATED QUALITY OF LIFE BETWEEN DIALYSIS PATIENTS AND KIDNEY RECIPIENTS

Marzieh Latifi[1], Elahe Pourhossein[2], Habib Rahban[3]
Azadeh Sadatnaseri[4], Maryam Rahbar[5], Sanaz Dehghani[6]

[1]Medical ethics and law research center, Shahid Beheshti University of Medical Sciences, (SBMU), Tehran, Iran
[2]Organ Procurement Unit, Sina Hospital, Tehran University of Medical Sciences (TUMS), Tehran, Iran.
[3]Cardiovascular Research Foundation of Southern California, Beverly Hills, CA & Creighton University School of Medicine, St. Joseph Hospital and Medical Center, Department of Cardiovascular Disease, Phoenix, Arizona, USA
[4]Fellowship of interventional echocardiography, Department of Cardiology, Sina University Hospital, Tehran University of Medical science, (TUMS), Tehran, Iran
[5]Associate professor of nephrology, Sina Hospital, Tehran University of Medical Sciences (TUMS); Tehran, Iran
[6]Organ Procurement Unit, Sina Hospital, Tehran University of Medical Sciences (TUMS) & Iranian Tissue Bank & Research Center, Tehran University of Medical Sciences (TUMS), Tehran, Iran

Correspondence:
Sanaz Dehghani (e-mail: sanaz_dehghani2002@yahoo.com)

Submitted: 19.07.2023 // Accepted: 26.12.2023

Ankara Yıldırım Beyazıt University Faculty of Medicine
Department of Family Medicine

ANKARA MEDICAL JOURNAL

Abstract

Objectives: Health-related quality of life (HRQOL) assessment is important for patients with end-stage kidney disease. This study aimed to determine the contribution of demographic factors to HRQOL in affected kidney recipients and dialysis patients on the waiting list for kidney transplantation in Iran.

Materials and Methods: This was a comparative survey. We required 196 patients in the Sina Organ Procurement Unit. HRQOL of 100 kidney recipients was measured using Study Short-Form 36 and compared with 96 dialysis patients. The factors investigated were age, gender, and cause of kidney failure; data were evaluated using SPSS 16.0 software.

Results: The scores of both groups were ordered from high to low in the following three dimensions: physical functioning, emotional well-being, and vitality. The mean physical component scores in kidney recipients and dialysis patients were 14.44±4.32 and 5.91±4.60, respectively. The mean mental component summary scores in kidney recipients and dialysis patients were 5.91 ± 4.60 and 5.12 ± 2.11, respectively. There were significant differences in all domains of HRQOL except role limitations due to emotional problems and emotional well-being in both groups (t = 0.963, P = 0.420). Age made the largest unique contribution (β = 0.211) to the physical component, while marital status was the greatest contributing factor to the mental component.

Conclusion: HRQOL improved after successful kidney transplantation compared to dialysis patients, despite kidney transplant patients suffering the effect of using immunosuppressive medicine and being subject to infectious complications and tumors. This study shows that we have reached the primary goal of transplantation, which is to improve the HRQOL of kidney recipients.

Keywords: Health-related quality of life, SF36 questionnaire, dialysis patients, kidney recipient, transplantation.

Introduction

Available kidney replacement therapies include peritoneal dialysis, hemodialysis, and kidney transplantation. Dialysis and transplantation are two available treatments for end-stage renal disease (ESRD).[1] Kidney disease patients who need renal replacement therapy have impaired health-related quality of life.[2]

Between 2001 and the end of 2021, 54162 kidney transplantations (from living: 38899, from deceased: 15263) have been performed in Iran. In 2021, 1777 patients with ESRD underwent kidney transplantation from deceased and living donors in Iran.[3]

Kidney transplantation is the most reliable treatment for patients with end-stage kidney disease and offers improved survival compared with dialysis.[4] According to the World Health Organization (WHO), kidney transplantation is accepted as one of the best treatments for chronic kidney disease.[5] Kidney transplantation reduces mortality and improves the health-related quality of life for most patients when compared with dialysis.[6]

Both end-stage renal disease (ESRD) and kidney transplants have a large impact on several aspects of everyday life and thus affect their health-related quality of life (HRQOL),[7] which was defined by the WHO as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their aims, expectations, standards, and concerns". [8]

HRQOL, an individual's quality of physical, emotional, and social function in the face of a medical or health problem, is a multidimensional concept.[9] It goes beyond direct measures of general health, such as life expectancy and causes of death, and focuses on the impact that health status has on a patient's daily life.[10]

Reducing the effect of ESRD could potentially improve HRQOL. Several studies have reported an overall improvement in HRQOL after transplantation[11,12]. The SF-36 tool (SF-36) has become the standard measure used worldwide. It is considered a valid and reliable tool useful for assessing the HQOL of kidney patients.[13] Patient self-reported HRQOL scores provide outcome measures for assessing the efficacy of treatment and disease severity.[14]

The level of health-related quality of life of patients undergoing dialysis decreases in the various stages of kidney disease; this may be attributed to many factors.[15] The transplantation goal is not only to ensure their survival but also to offer patients a higher quality of life compared with the condition before transplantation, achieving a good balance between the functional efficacy of the organ and the patient's psychological and physical components.[16] Therefore, we submitted the SF-36 questionnaire to both patients who underwent

kidney transplantation from deceased donors and dialysis patients on a waiting list. We then compared the HRQOL of the life of kidney transplant patients with that of dialysis patients on the waiting list.

The purpose of this study was to examine differences between aspects of life quality among patients receiving renal transplants compared with dialysis patients.

Materials and Methods

The present descriptive correlational study was conducted on the Sina Organ Procurement Unit (OPU).

Using the Cochran Sample Size Formula, 189 individuals were enrolled in the study.

Convenience sampling was chosen to be the sampling method as the patients who visited the Sina organ procurement unit for periodical visits after transplantation, as well as dialysis patients who had registered on the kidney waiting list, were selected as the sample size. All patients agreed to answer the questionnaire. All patients knew that the topic of the study was their health-related quality of life. Eventually, with a probability of 10% of sample dropout, the sample size was 207 people (103 kidney recipient patients and 104 dialysis patients on the waiting list between 2020-2022).

Inclusion criteria for kidney recipients were three months or more post-renal transplantation and a functional renal graft (the patient does not need dialysis). Inclusion criteria for dialysis patients in the waiting list were three months or more in the waiting list. Additional inclusion criteria were being at least 18 years old, the ability to speak and read in Farsi, and availability and willingness to participate in this study.

Patients with multiple organ transplants or those who had more than one renal transplant, patients with transplantation from a living donor, and patients on a living donor waiting list were excluded from this study.

The HRQOL standardized questionnaire (SF-36) was completed for all participants. Demographic information was collected at the same time, including current age, gender, employment status, level of education, marital status, family financial income, cause of kidney failure, and the duration of dialysis before transplantation (in months).

Health-related quality of life / SF-36

The SF-36 tool assessment is used to evaluate the physical, psychological, and social domains of health, seen as distinct areas that are influenced by a person's experiences, beliefs, expectations, and attitudes.[16] The SF-36 has eight scaled scores; the scores are weighted sums of the questions in each section. Scores for each of the

eight health concepts range from 0 (worst possible health state measured by the questionnaire) to 100 (best possible health state). Higher scores declare better self-perceived health. Questions including Physical Functioning (PF), Role Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional (RE), and Mental Health (MH). There are 2 component summary scores: the physical component summary (PCS) and the mental component summary (MCS).[17,18] The Cronbach's α = 0. 0.888 of SF-36 tool were calculated [19]. The survey began in March 2022, and the last response was collected in July 2022. Clinical and demographic data were collected from patient records in the Sina OPU. Each interview was conducted by the transplant coordinator, suitably trained and qualified to work with questionnaires, following instructions given by the study designers.

The present descriptive correlational study was conducted after obtaining approval from the ethics committee of the Tehran University of Medical Sciences. The aim, risks, and benefits of this study were explained to both groups before their participation. The participation was voluntary, and refusal to participate would not influence their clinical care.[20]

Statistical analysis

The Kolmogorov–Smirnov test was used to test the data distribution. Results showed a normal distribution of all dependent variables. Both the Chi-square and an independent sample t-test were used to compare the demographic variables in both groups. Moreover, the Chi-square test was conducted to compare the SF-36 health domain scores between kidney transplant recipients and dialysis patients on the waiting list. The students' t-test was also used to assess differences in SF-36 scores between the two populations. ANOVA was used if there were more than two groups. A multiple linear regression model also was used for data analysis. Statistical analyses were performed using SPSS16. The significance level was set at $P<0.05$.

Results

Demographic and Clinical Characteristics

During the two years under review, 207 patients were eligible for this study; of these, 196 completed the questionnaires (Dialysis patients on the waiting list [n=96], Kidney recipients [n=100]).

The sample covered a wide range of ages from 18 years to 79 years. Overall, the patients were predominantly male (135/68.87%) with a mean age of 47.28 ± 13.30 years with a median age of 47 years.

Altogether, there were 64 causes of ESRD, with hypertension the most common, followed by diabetes mellitus, Polycystic kidney disease (PKD), proteinuria, kidney stones, infection, and 56 other causes. The demographic and clinical characteristics data of the participants are summarized in Table 1.

Table 1. Sociodemographic and clinical characteristics of the participants (n = 196)

	Total (n = 196)	**Dialysis patients on waiting list (n = 96)**	**Kidney recipients (n = 100)**
Age, years (mean)	47.28± 13.30 (Median=47)	46.42± 13.51 (Median=45)	48.07± 13.23 (Median=48)
Marital Status			
Single	29 (14.79)	15 (15.63%)	14 (14%)
Married	159 (81.13)	77 (80.20%)	82 (82%)
Other	8 (4.08)	4 (4.17%)	4 (4%)
Number of children (among married and others)			
0	24 (14.20 %)	26 (27.08%)	9(10.98)
1-2	84(49.70%)	38 (39.59%)	45 (54.88%)
3-4	47 (27.82%)	23 (23.95%)	23 (28.05%)
More than 5	14 (8.28%)	9 (9.38%)	5 (6.09)
Sex			
Female	62 (31.63%)	33 (34.37%)	29 (29%)
Male	134 (68.37%)	63 (65.63%)	71 (71%)
Job			
Freelancer	65 (33.16%)	32 (33.33%)	33(33%)
Housewife	46 (23.46%)	22 (22.90%)	24 (24%)
Retirement	32 (16.33%)	14 (14.59%)	18 (18%)
Employee	22 (11.23%)	8 (8.33%)	14 (14%)
Worker	7 (3.57%)	5 (5.22%)	2 (2%)
Student	6 (3.07%)	3 (3.13%)	3 (3%)
Unemployment	18 (9.18%)	12 (12.50%)	6 (6%)
Level of Education			
Under diploma	87 (44.39%)	52 (54.17%)	35 (35%)
Diploma	77 (39.29%)	30 (31.26%)	47 (47%)
BSc/ Master	27 (13.77%)	11 (11.45%)	16 (16%)
Doctorate	5(2.55%)	3 (3.12%)	2 (2%)
Cause of ESRD			
Hypertension	63 (32.14%)	27 (28.13%)	36 (36%)
Diabetes Mellitus	35 (17.86%)	28 (29.17%)	7 (7%)
Infection	5 (2.55%)	1 (1.04%)	4 (4%)
PKD	20 (10.21%)	12 (12.50%)	8 (8%)
Kidney stone	7 (3.57%)	4 (4.16%)	3 (3%)
Proteinuria	10 (5.10%)	4 (4.16%)	6(6%)
Other	56 (28.57%)	20 (20.84%)	36 (36%)

Health-Related Quality of Life

According to Student's t-test, comparing the SF-36 scores of dialysis patients with the scores of kidney recipients, there were significant differences in all SF-36 dimensions except role limitations due to emotional problems (t = 0.963, P = 0.420) and emotional wellbeing (t = 4.711, P = 0.070).

In addition, there is a significant difference in the overall physical dimension (t = 6.652, P = 0.001) and emotional dimension (t = 2.763, P =0.001) between the two groups. Comparisons of the mean scores of SF-36 scores between kidney transplant recipients and dialysis patients are shown in Table 2.

According to the ANOVA test, there were statistically significant differences between the physical function (F = 2.7, P = 0.017), energy (F = 3.2, P = 0.006), general health (F = 3.7, P = 0.002), physical component summary (F = 3.05, P = 0.009), and job in kidney recipients.

Based on this test, there were not any significant differences between the genders based on HRQOL dimensions in dialysis patients.

This test didn't show any significant differences between each dimension of HRQOL and the cause of ESRD in recipient patients. This test showed that there are no significant differences between each dimension of HRQOL and the number of children in recipient patients.

Table 2. Comparisons of the mean scores of SF-36 between kidney transplant recipients and dialysis patients on the waiting list

Dimension	Kidney recipients	Dialysis patients	t	P
	M ± SD	M ± SD		
Physical functioning	71.82 ± 32.00	45.11 ± 34.89	5.551	0.001
Role limitations due to emotional problems	13.05 ± 13.21	11.59 ± 14.90	0.963	0.420
Role limitations due to physical health	10.80 ± 12.51	6.66 ± 11.50	2.392	0.009
vitality	26.59 ± 9.91	20.62 ± 11.12	3.980	0.001
Emotional well being	33.33 ± 10.92	30.35 ± 11.81	4.711	0.070
Social functioning	12.80 ± 4.81	9.82 ± 3.72	4.373	0.001
Bodily pain	17.34 ± 4.85	13.23 ± 6.11	5.281	0.001
General Health	17.33 ± 8.22	13.92 ± 7.89	3.760	0.001
Physical component summary	14.44 ± 4.32	9.83 ± 4.00	6.652	0.001
Mental component summary	5.91 ± 4.60	5.12 ± 2.11	2.763	0.001

According to Spearman analysis, there were statistically significant differences between the physical function (r = -3.62, P = 0.001), physical dimension (F = -2.65, P = 0.008), overall health-related quality of life (F = -2.65, P = 0.008) and age in kidney recipients. This test showed significant differences between general health (F = -1.81, P = 0.008) and the age of dialysis patients.

This test didn't show any significant differences between each dimension of HRQOL and the level of education and marital status in both groups.

According to the ANOVA test, there were significant differences between the genders with respect to physical function, energy, pain, and physical component summary. However, there were not any significant differences between the genders based on HRQOL dimensions in dialysis patients.

This test didn't show any significant differences between each dimension of HRQOL and the cause of ESRD in recipient patients. However, there were statistically significant differences between the physical function, energy, general health, physical component summary, and job in kidney recipients.

This test showed that there are no significant differences between each dimension of HRQOL and the number of children in recipient patients. This test also showed that there were no statistically significant differences between emotional well-being and the number of children in dialysis patients (Table 3).

According to Spearman analysis, there were statistically significant differences between the physical function (r = -3.620, P = 0.001), physical dimension (F = -2.652, P = 0.008), overall health-related quality of life (F = -2.650, P = 0.008), and age in kidney recipients. This test showed significant differences between general health (F = -1.813, P = 0.008) and the age of dialysis patients. This test didn't show any significant differences between each dimension of HRQOL and the level of education and marital status in both groups.

Multiple Linear Regression of Associations with HRQOL in Participation

The PCS score was associated with age (P = 0.022), gender (P = 0.021), level of education (p = 0.005), cause of ESRD (P = 0.020), and the number of children (P = 0.013). The model explains 4.50% of the variance in PCS. Marital status (P = 0.032) was associated with MCS. The model explains 37% of the variance in MCS. Age made the largest unique contribution (β = 0.211) to the PCS, while marital status (β = 0.213) was the greatest contributing factor to MCS (Table 4).

Table 3. Differences between gender, Number of children, and cause of brain death with SF_{36} dimensions in dialysis patients

	Component	**F**	**P**
Gender	Physical function	8.811	0.004
	Energy	3.724	0.040
	Pain	6.682	0.010
	Physical component summary	9.570	0.003
Cause of ESRD	Physical function	2.304	0.041
	Pain	3.331	0.005
	General Health	2	0.040
	Physical component summary	2.691	0.019
Number of children	Social function	2.645	0.008
	General Health	2.231	0.021

Table 4. Multiple linear regression between predictors variables and physical and mental component summary in all participants

Variable	**β**	**t**	**p**	**R^2**
Physical component summary				
Age	0.211	2.302	0.022	0.045
Gender	0.162	2.333	0.021	
Type of Job	0.001	0.040	0.960	
Level of education	0.201	2.811	0.005	
Cause of ESRD	0.152	2.201	0.020	
Lance of dialysis	0.073	0.952	0.344	
Marital status	0.102	1.112	0.265	
Number of children	0.170	2.500	0.013	
Mental component summary				
Age	0.050	0.573	0.561	0.370
Gender	0.083	1.131	0.253	
Type of Job	0.042	0.535	0.592	
Level of education	0.081	1.111	0.264	
Cause of ESRD	0.002	0.110	0.915	
Date of transplant	0.000	0.083	0.933	
Marital status	0.213	2.184	0.032	
Number of children	0.097	1.291	0.192	

Discussion

Nowadays, HRQOL is an issue of interest about outcomes after kidney transplantation, as well as a cause of concern for those under dialysis in that varying degree of disease-specific physical and psychological impairments are attributed to drug adverse effects.[21]

The results of this study show a worse HRQOL in dialysis patients compared to kidney recipients, typically in the areas of role limitation due to physical health problems, social functioning, and role limitations due to emotional problems.

We observed that patients after kidney transplantation have a higher HRQOL compared to dialysis patients. Similar to our study, Dew et al. demonstrated statistically significant pre- to post-transplant improvements in physical function, mental health, cognitive status, and overall HRQOL situation, [22] whereas others find no difference between the recipients and dialysis patients.[23]

Regarding our results, there were significant differences between the genders related to physical function, energy, pain, and physical component summary. However, in dialysis patients, a significant difference was not shown between the female/male and HRQOL dimensions. Mittal et al. declared that men have higher physical function scores than women in chronic kidney disease at the dialysis stage; however, mental function scores were similar.[24] In contrast, according to Esen et al., male patients with chronic kidney disease have better general health, vitality, and mental health scores.[25]

In spite of the improvement of physical function, pain, general health, and overall physical dimension, the cause of ESRD did not significantly influence HRQOL in recipient patients. Compatible with our research, Essue et al.[26] showed that kidney disease is associated with dietary and social restrictions, which make treatment acceptance difficult and may decrease HRQOL.

Physical function, physical dimension, overall HRQOL, and age exhibited statistically significant differences among kidney recipients. Dialysis patients also displayed a significant difference between general health and age.

Similar to our results, several studies showed that the HRQOL score is higher in younger patients than in older patients in both groups.[27,28] In contrast, another research[29] has shown that there was no significant association between age and HRQOL.

The result showed that there is a significant difference between each dimension of HRQOL and the level of education and marital status in both groups. In addition, there were statistically significant differences between emotional well-being, social function, general health, and the number of children in dialysis patients.

These results were the same as Ong et al.,[30] which showed that married patients in dialysis reported better health-related quality of life scores than those patients who were single, separated, and widowed, in favor of family support in coping and managing the illness, as well as in times of stressful situations.

Several important limitations of our study should also be noted. Kidney recipients and dialysis patients from only a single center were enrolled. In addition, the cross-sectional nature of our research does not allow us to draw conclusions about the relationship between treatment modality and HRQOL. Our sample size had similar social and demographic characteristics. Consequently, this is unlikely to have caused a systematic bias in our results.

It is advisable to design and implement an intervention program of support and follow-up of HRQOL for dialysis patients.

In conclusion, HRQOL improved after kidney transplantation compared to dialysis patients. Based on the results, SF36 was a useful tool as it allowed the transplant team to focus on different aspects of the HRQOL of kidney patients.

According to our knowledge, this study compares, for the first time in Iran, the quality of life of dialysis patients and kidney recipients, and also examines the demographic indicators and the quality of life in both groups in detail.

Regular evaluation of HRQOL may help to identify high-risk patients who may benefit from increased attention and risk modification interventions. Therefore, considering emotional problems is necessary in the recipient group by continuous access to mental and physical health support services. They also reinforce the need for longitudinal and intervention studies for dialysis patients. It is advisable to design and implement an intervention program of support and follow-up of HRQOL for dialysis patients.

Ethical Considerations: The present descriptive correlational study was conducted after obtaining approval from the ethics committee of the Tehran University of Medical Sciences, with approval ID: IR.TUMS.SINAHOSPITAL.REC.1401.080, on 17.11.2022.

Conflict of Interest: The authors declare that they have no conflict of interest.

References

1. 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. *American Journal of Kidney Diseases.* 2013;62(5):953-73 (doi:https://doi.org/10.1053/j.ajkd.2013.03.022).
2. McKercher C, Sanderson K, Jose MD. Psychosocial factors in people with chronic kidney disease prior to renal replacement therapy. *Nephrology.* 2013;18(9):585-91.
3. WHO. Global strategy on diet, physical activity and health: what are the causes? [Internet]. 2017; http://www.whoint/dietphysicalactivity/childhood_why/en/.
4. van Walraven C, Austin PC, Knoll G. Predicting potential survival benefit of renal transplantation in patients with chronic kidney disease. *Cmaj.* 2010;182(7):666-72.
5. Perico N, Remuzzi G. Chronic kidney disease: a research and public health priority. *Nephrology Dialysis Transplantation.* 2012;27(suppl_3):iii19-iii26 (doi:10.1093/ndt/gfs284).
6. Molnar-Varga M, Molnar MZ, Szeifert L, et al. Health-Related Quality of Life and Clinical Outcomes in Kidney Transplant Recipients. *American Journal of Kidney Diseases.* 2011;58(3):444-52 (doi:https://doi.org/10.1053/j.ajkd.2011.03.028).
7. Barotfi S, Molnar MZ, Almasi C, et al. Validation of the Kidney Disease Quality of Life-Short Form questionnaire in kidney transplant patients. *Journal of Psychosomatic Research.* 2006;60(5):495-504 (doi:https://doi.org/10.1016/j.jpsychores.2005.09.009).
8. Uchmanowicz I, Gobbens RJ. The relationship between frailty, anxiety and depression, and health-related quality of life in elderly patients with heart failure. *Clinical interventions in aging.* 2015:1595-600.
9. Patrick DL, Bush JW, Chen MM. Methods for measuring levels of well-being for a health status index. *Health services research.* 1973;8(3):228.
10. Mouelhi Y, Jouve E, Alessandrini M, et al. Factors associated with Health-Related Quality of Life in Kidney Transplant Recipients in France. *BMC Nephrology.* 2018;19(1):99 (doi:10.1186/s12882-018-0893-6).
11. Kostro JZ, Hellmann A, Kobiela J, et al. Quality of Life After Kidney Transplantation: A Prospective Study. *Transplantation Proceedings.* 2016;48(1):50-4 (doi:https://doi.org/10.1016/j.transproceed.2015.10.058).
12. Prihodova L, Nagyova I, Rosenberger J, et al. Health-Related Quality of Life 3 Months After Kidney Transplantation as a Predictor of Survival Over 10 Years: A Longitudinal Study. *Transplantation.* 2014;97(11):1139-45 (doi:10.1097/01.TP.0000441092.24593.1e).

13. Erez G, Selman L, Murtagh FEM. Measuring health-related quality of life in patients with conservatively managed stage 5 chronic kidney disease: limitations of the Medical Outcomes Study Short Form 36: SF-36. *Quality of Life Research.* 2016;25(11):2799-809 (doi:10.1007/s11136-016-1313-7).
14. DeOreo PB. Hemodialysis patient-assessed functional health status predicts continued survival, hospitalization, and dialysis-attendance compliance. *American journal of kidney diseases.* 1997;30(2):204-12.
15. Pagels AA, Söderkvist BK, Medin C, Hylander B, Heiwe S. Health-related quality of life in different stages of chronic kidney disease and at initiation of dialysis treatment. *Health and Quality of Life Outcomes.* 2012;10(1):71 (doi:10.1186/1477-7525-10-71).
16. Burra P, De Bona M. Quality of life following organ transplantation. *Transplant International.* 2007;20(5):397-409.
17. Gao B, Song X, Hao J, et al. Association Between Serum Uric Acid and Depression in Patients with Chronic Kidney Disease not Requiring Kidney Dialysis: Cross-Sectional and Longitudinal Analyses. *Med Sci Monit.* 2020;26:e925386-e (doi:10.12659/MSM.925386).
18. Lins L, Carvalho FM. SF-36 total score as a single measure of health-related quality of life: Scoping review. *SAGE open medicine.* 2016;4:2050312116671725.
19. Sajadi SA, Ebadi A, Moradian ST, Akbari R. Designing and Validation of Health-Related Quality of Life Inventory for Family Caregivers of Hemodialysis Patients. *International journal of community based nursing and midwifery.* 2020;8(2):164-76 (doi:10.30476/ijcbnm.2020.83081.1118).
20. Liu H-X, Lin J, Lin X-H, et al. Quality of sleep and health-related quality of life in renal transplant recipients. *Int J Clin Exp Med.* 2015;8(9):16191-8.
21. Fiebiger W, Mitterbauer C, Oberbauer R. Health-related quality of life outcomes after kidney transplantation. *Health and Quality of Life Outcomes.* 2004;2(1):2 (doi:10.1186/1477-7525-2-2).
22. Maglakelidze N, Pantsulaia T, Tchokhonelidze I, Managadze L, Chkhotua A. Assessment of Health-Related Quality of Life in Renal Transplant Recipients and Dialysis Patients. *Transplantation Proceedings.* 2011;43(1):376-9 (doi:https://doi.org/10.1016/j.transproceed.2010.12.015).
23. Wasserfallen J-B, Halabi G, Saudan P, et al. Quality of life on chronic dialysis: comparison between haemodialysis and peritoneal dialysis. *Nephrology Dialysis Transplantation.* 2004;19(6):1594-9.
24. Mittal SK, Ahern L, Flaster E, Maesaka JK, Fishbane S. Self-assessed physical and mental function of haemodialysis patients. *Nephrology Dialysis Transplantation.* 2001;16(7):1387-94.
25. Esen B, Kahvecioglu S, Atay AE, et al. Evaluation of relationship between sexual functions, depression and quality of life in patients with chronic kidney disease at predialysis stage. *Renal Failure.* 2015;37(2):262-7 (doi:10.3109/0886022X.2014.990348).
26. Essue BM, Wong G, Chapman J, Li Q, Jan S. How are patients managing with the costs of care for chronic kidney disease in Australia? A cross-sectional study. *BMC nephrology.* 2013;14(1):1-9.

27. Fujisawa M, Ichikawa Y, Yoshiya K, et al. Assessment of health-related quality of life in renal transplant and hemodialysis patients using the SF-36 health survey. *Urology.* 2000;56(2):201-6 (doi:https://doi.org/10.1016/S0090-4295(00)00623-3).
28. Balaska A, Moustafellos P, Gourgiotis S, et al. Changes in health-related quality of life in Greek adult patients 1 year after successful renal transplantation. *Exp Clin Transplant.* 2006;4(2):521-4.
29. Weber M, Faravardeh A, Jackson S, et al. Quality of life in elderly kidney transplant recipients. *Journal of the American Geriatrics Society.* 2014;62(10):1877-82.
30. Ong SC, Chow WL, van der Erf S, et al. What factors really matter? Health-related quality of life for patients on kidney transplant waiting list. *Ann Acad Med Singapore.* 2013;42(12):657-66.