Nephro-Urol Mon. 2019 May; 11(2):e79497. doi: 10.5812/numonthly.79497.

Published online 2019 May 6. **Research Article**

Effect of Renal Transplantation on Health-Related Quality of Life in Patients with End-Stage Renal Disease; A Quasi-Experimental Study

Razieh Sadat Mousavi-Roknabadi [1], Faezeh Ershadi [1], Negin Hadi [2,*], Jamshid Roozbeh Shahroodi [3], Zahra Shayan [4], Soheila Keshavarz [1], Halimeh Raeisi Sarbizhan [1] and Afsaneh Roozrokh [5]

[1] Community Medicine Department, Faculty of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
[2] Community Medicine Department, Neuro-Sciences Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
[3] Department of Internal Medicine, Nephrology Ward, Faculty of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
[4] Trauma Research Center, Department of Community Medicine, The Medical School, Shiraz University of Medical Sciences, Shiraz, Iran
[5] Faculty of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran

[*] *Corresponding author*: MD, MPH, Professor of Community Medicine, Community Medicine Department, Neuro-Sciences Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. Email: hadin@sums.ac.ir

Received 2018 May 21; **Revised** 2019 January 31; **Accepted** 2019 March 16.

Abstract

Background: Renal transplantation is one of the best modalities to lengthen the life expectancy of patients with end-stage renal disease (ESRD). However, no sufficient documents exist regarding the effects of renal transplantation on the health-related quality of life (HRQOL) especially in Iranian population.

Objectives: This study aimed to determine the possible influence of renal transplantation in different scales of HRQOL in southern Iran.

Methods: This Quasi-experimental study was carried out with 120 patient candidate for renal transplantation (Apr 2012 - Jan 2014). Using the general SF-36 questionnaire, HRQOL of the patients 1 week before and 3 months after the transplantation was evaluated. All data were analyzed statistically using descriptive and analytical tests ($\alpha = 0.05$).

Results: Seventy-eight patients (65%) were male. The mean (SD) of the age was 38.92 (13.259) years. HRQOL and its eight scales were significantly different before and after the transplantation ($P < 0.001$). There was a significant difference between general perception of health and primary school, as well as diploma ($P = 0.008$). Other demographical factors such as age, gender, marital status and type of donor had no impact on HRQOL, statistically. There was no correlation between HRQOL and the length of facing the disease, except in the subgroup of role limitation due to physical problems ($P = 0.01$).

Conclusions: The study showed that renal transplantation has sufficient credibility in improvement of HRQOL in patients with ESRD. Moreover, continuous enhancement of education level and public knowledge might be as effective as development of medical serving systems in maintaining and achieving greater improvement in HRQOL.

Keywords: End-Stage Renal Disease, Renal Transplantation, Health-Related Quality of Life

1. Background

Chronic kidney disease (CKD) is a global health issue (1), and is defined by malfunctioning of the kidney, usually associated with declined glomerular filtration rate over a period of months or years (2). CKD is a major and considerable clinical problem which leads to end-stage renal disease (ESRD) over time, and has become a significant social and economic problem worldwide (1, 3). Studies showed that the patients with ESRD, who are on dialysis have poor quality of life (QOL) in compared with the general population, as well as patients with other chronic diseases (4, 5). Several studies, for instance Hadi et al. (6), in Iran Esposito et al. (7), in Italy Ronai et al. (8), in Hungary showed that patients with CKD who underwent dialysis, suffered from poor health and QOL. Disability in patients undergoing hemodialysis or peritoneal dialysis can result in increased risk of inflammation, malnutrition, anemia, sleep-related problems, obstructive sleep apnea, unemployment, as well as depression. These patients usually experience chronic tiredness, higher pain susceptibility, major depression (as a common psychiatric sequel of CKD), nervousness, sadness and limitation of daily physical activities. On the other hand, defective physical performance, protein-energy wasting and abnormal body composition can be causes of increased risk of hospitalization and morbidity in these patients (7-10), which can affect the patients' QOL.

In patients with ESRD, renal transplantation (RT) is considered as the best treatment with a survival advantage and achieving improved outcomes at a lower cost. It can improve a patient's QOL in terms of physical and psychological function in comparison with dialysis, significantly (4, 11). Patients who underwent RT live much longer, nearly 15 - 20 years more than patients without transplantation (12). Health-related quality of life (HRQOL) has become an important indicator of effective patient treatment and graft survival rates in accompaniment with patient and graft survival rates (4). RT has been performed for 50 years in Iran (13, 14), but to our knowledge, few studies have evaluated HRQOL in patients with RT as a determinant of long-term clinical outcomes, and all of them revealed lower physical HRQOL with mortality, and also they focused on the obvious effect of transplantation in decreasing the substantial number of death and increasing life expectancy in the patient with ESRD, but the feeling of well-being and satisfaction, which have more significant influence on daily life is less considered (15).

The general SF-36 questionnaire is a useful tool in assessing and comparing the HRQOL in patients with ESRD and RT (16-18).

2. Objectives

The current study aimed to evaluate the various aspects of HRQOL beside the related variables in the patients who underwent RT as the choice of treatment, using general SF-36 questionnaire. So far, such a study has not been conducted in Shiraz hospitals, as the main referral center of RT in southern Iran.

3. Methods

3.1. Study Design and Population

This was a quasi-experimental study from April 2012 to January 2014 on adult patients with ESRD, all of whom were candidates for RT at Shiraz Organ Transplantation Center (STRC) in Namazi hospital, the largest university-affiliated hospital in southern Iran, with approximately 24000 admission in 29 wards, annually.

3.2. Participants

The inclusion criteria were all of adult patients (age more than 18 years), candidate and underwent RT due to ESRD, who were admitted in Shiraz Namazi hospital transplantation ward. All patients who did not agree to complete the questionnaire form, uncompleted forms or refused signing the written consent form were excluded from the study.

3.3. Sample Size

Using Medcalc software for Windows, 120 patients were calculated as necessary for participating in this study (α = 0.05, β = 0.2) (15).

3.4. Evaluation Tools

The general SF-36 questionnaire was used, which is considered as a popular tool for measuring HRQOL in patients with ESRD, and comparing different treatment in these patients as well (4, 15-17). It consists of eight scales including physical functions (10 questions), social functions (2 questions), role limitation due to physical problems (4 questions), role limitations due to emotional problems (3 questions), mental health (5 questions), energy and vitality (4 questions), bodily pain (2 questions), and general perception of health (5 questions). The scores of scales were converted and summed from 0 (lowest HRQOL and poor functioning) to 100 (highest HRQOL and good functioning). A mean score was measured for each scale, ranging from 0 to 100, with higher scores suggesting a better outcome (3). The Persian version of SF-36 questionnaire was translated to Farsi and have been confirmed in Iranian population. Also, it adapted and the reliability and validity were calculated by Montazeri et al. (19). Demographical information such as (age, gender, marital status, education, length of facing disease and types of donation including cadaver, living-unrelated, living-related were collected as well.

3.5. Study Protocol

The participants were given two SF-36 questionnaires 1 week before and 3 months after RT, when they came for follow up to determine the present HRQOL. The patients were asked to fill out the form, otherwise, the questionnaire was filled out the by face to face interview by one of the researchers. The difference of QOL before and after RT, as well as all other eight scales was compared in different types of donation group, different educational levels, different genders and different marital statuses.

3.6. Statistical Analysis

All analyses were performed using the Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) version 23.0. Since physical functions, social functions, role limitation due to physical problems, role limitations due to emotional problems, mental health, energy and vitality, bodily pain and general perception of health were not parametric by means of Kolmogorov-Smirnov test, Wilcoxon test was used to compare the difference of HRQOL before and after RT. Mann-Whitney U test was used to compare the difference of HRQOL before and after the transplantation in different genders and marital

statuses. Moreover, the Kruskal Wallis test was used to compare HRQOL among different groups of education and types of donation. Pearson's correlation was employed to determine the correlation between HRQOL before and after the transplantation and age, as well as length of facing the disease. The results are presented as mean (standard deviation) (SD) for continuous variables, and summarized in number (percentage) for categorical ones. Two-sided P value < 0.05 and confidence interval (CI) of 95% were considered as statistically significant.

4. Results

Overall, 120 patients participated, from which 78 (65%) were male. The mean (SD) of age was 38.92 (13.26) (range, 12 - 70) years and 84 patients (70%) were married. Most of them (34.4%) had a high school diploma, and about 63% of them received kidney from cadaver-donor. The mean (SD) of duration of facing the disease was 3.91 (3.74) (range, 0.3 - 20) years (Table 1).

As shown in table 2, HRQOL was significantly higher after transplantation in all eight scales ($p < 0.0001$). There was no statistical significance between difference of HRQOL before and after transplantation of all 8 scales among neither different genders nor different marital statuses. Difference of HRQOL was not statistically important among different educational levels in all 8 scales too, except for general perception of health (P = 0.037). Since the data were nonparametric, levels of education were compared two by two in regards of general perception of health, using the Wilcoxon test, which showed higher HRQOL in diploma rather than primary school level (P = 0.008). Moreover, there were no significant differences between HRQOL before and after transplantation and types of donor (Table 3). Furthermore, there was no correlation between difference of HRQOL and age, as well as the length of facing the disease except in subgroup of role limitation due to physical problems (P = 0.01) (Table 4).

Table 1. Patients' Characteristics

Variables	Values
Age, y	
Mean ± SD	38.92 ± 13.26
Minimum - Maximum	12 - 17
Gender, No. (%)	
Male	78 (65)
Female	42 (35)
Marital status, No. (%)	
Single	36 (30)
Married	84 (70)
Educational level, No. (%)	
Illiterate	9 (7.6)
Primary school	33 (27.7)
High school	23 (19.2)
Diploma	41 (34.4)
Bachelor	13 (10.8)
Duration of facing the disease, mean ± SD	3.91 ± 3.74
Types of donation, No. (%)	
Cadaver	76 (63.3)
Living-unrelated	21 (17.5)
Living-related	22 (18.3)

5. Discussion

In the present study, we evaluated the various aspects of HRQOL beside the related variables in the patients who underwent RT using the general SF-36 questionnaire. Also, the correlation of socio-demographic factors such as age, gender and educational status were determined as well. Tayebi et al. in Tehran, Iran used a different questionnaire to assess QOL of RT patient called Kidney Transplantation Questionnaire (KTQ-25), and they showed significant relationship between QOL score and gender, cause of ESRD, occupation and economic satisfaction (20). In another study, Perez San Gregorio et al. used a structured interview and SF-36 questionnaire, Euroqol-5D (EQ-5D) Health questionnaires and end-stage renal disease symptom checklist-transplantation module (ESRD-SCL). Their results showed that HRQOL in RT patients improved with the course of time in 4 areas: physical functioning, psychological and mental health, execution of daily tasks, and subjective perception of own state of health (15).

The current study showed that HRQOL significantly improved after RT in patients with ESRD in all 8 scales. Likewise, Mini et al. in India showed that transplanted patients had better HRQOL in only physical function, psychological state, execution of daily tasks, and subjective perception of health (21). Lim et al. in a multicenter, 9-year observational cohort study in Korea, analyzed the data of 175 patients with RT. They found that at the end of 2-years follow up all QOL scores using the SF-36 questionnaire and chronic kidney disease targeted score were significantly increased compared to baseline values. Also, both physical and mental scale scores were improved after transplantation (4). Rambod et al. also showed that the mean score of QOL in patients with RT were significantly better when compared with hemodialysis patients in Iran in their study. They concluded that RT has enough efficacy to improve the patients' QOL (22).

In this study, most of the participants were male and there was no significant difference between gender and HRQOL. In contrast, Tayebi et al indicated a significant

Table 2. Comparing Eight Health-Related Quality of Life Scales before and after Renal Transplantation According to Age and Marital Status[a]

Scales of Quality of Life		Before/After Transplantation			Gender			Marital Status		
		Before Transplantation	After Transplantation	P Value	Male	Female	P Value	Single	Married	P Value
1	Physical function	49.88	54.99	< 0.0001[b]	57.75	65.60	0.236	55.41	62.67	0.136
2	Social function	53.73	48.61	< 0.0001[b]	57.67	65.75	0.216	60.44	60.52	0.990
3	Role limitation due to physical problems	26.73	39.51	< 0.0001[b]	57.69	56.71	0.210	61.94	59.88	0.293
4	Role limitation due to emotional problems	25.56	46.735	< 0.0001[b]	59.07	63.15	0.531	61.91	59.89	0.765
5	Mental health	30.04	54.09	< 0.0001[b]	60.69	60.14	0.934	59.63	60.86	0.858
6	Energy and vitality	24.375	55.64	< 0.0001[b]	59.69	62.00	0.727	61.31	60.14	0.865
7	Bodily pain	46.58	47.83	< 0.0001[b]	59.14	63.02	0.557	53.31	63.57	0.756
8	General perception of health	12.59	64.82	< 0.0001[b]	59.94	61.52	0.812	66.55	57.90	0.209

[a] Values are expressed as mean rank.
[b] Statistically significant.

Table 3. Comparing Eight Health-Related Quality of Life Scales Before and after Renal Transplantation According to Educational Status and Types of Donation[a]

Scales of Quality of Life		Educational Status					Types of Donation			
		Primary School	High School	Diploma	Bachelor	P Value	Cadaver	Living-Unrelated	Living-Related	P Value
1	Physical function	48.39	66.97	53.5	59.53	0.171	56.09	68.11	65.64	0.250
2	Social function	54.54	62.52	48.89	66.34	0.204	61.125	51.5	64.83	0.387
3	Role limitation due to physical problems	52.60	68.21	49.06	60.65	0.092	56.76	64.11	67.40	0.347
4	Role limitation due to emotional problems	54.22	61.65	52.51	57.26	0.71	55.197	63.84	73.35	0.781
5	Mental health	53.86	55.26	52.92	68.192	0.488	59.42	55.5	66.78	0.544
6	Energy and vitality	53.818	56.45	52.41	67.80	0.484	57.76	61.5	66.52	0.571
7	Bodily pain	53.71	61.28	54.85	51.84	0.786	58.28	55.86	70.52	0.288
8	General perception of health	45.01	57.26	61.530	70.153	0.0367[b]	58.79	54.95	69.64	0.328

[a] Values are expressed as mean rank.
[b] Statistically significant.

Table 4. Comparing Eight Health-Related Quality of Life Scales Before and after Renal Transplantation According to Age and Length of Facing the Disease

Scales of Quality of Life		Age		Length of Facing the Disease	
		Pearson Correlation	P Value	Pearson Correlation	P Value
1	Physical function	0.03	0.67	0.02	0.81
2	Social function	0.05	0.95	0.03	0.73
3	Role limitation due to physical problems	0.03	0.70	0.22	0.01[a]
4	Role limitation due to emotional problems	-0.04	0.64	0.13	0.15
5	Mental health	0.03	0.73	0.06	0.48
6	Energy and vitality	-0.11	0.19	0.01	0.87
7	Bodily pain	0.01	0.98	0.03	0.74
8	General perception of health	-0.08	0.34	0.04	0.59

[a] Statistically significant.

higher QOL in males ($P < 0.0001$) (20). Also, other studies in region of Croatia, Netherlands and France had the same results (23-25). Likewise, Hadi et al. showed that women with chronic renal failure had worse conditions in all aspects, except general health and social function (6). Overall, it seems that the general tendency of various surveys is toward the dominancy of the positive effect of the male gender in the concept of HRQOL, although our results didn't support this issue. The reason of this finding may be due to psychological characteristics of the male gender and emotional dominance of females in their behavior and life status.

Our result also showed no relationship between age and HRQOL, but in some studies like Prihodova et al.'s longitudinal study, younger age was associated with higher physical HRQOL. Likewise, older age and lower efficacy in getting support from family and friends was associated with higher mental HRQOL (26). However, another study in Croatia showed that the patients under the age of 65 years had a better score of HRQOL and demonstrated that age is

the only statistically significant predictor of both physical and mental component in HRQOL (24). Therefore, it is recommended that further investigation should be designed for finding the exact relationship between age and HRQOL. Moreover, all 70% of our patients were married, but there was no significant relationship between HRQOL and marital status, nevertheless a French survey mentioned that living alone has negative effect on HRQOL (25).

Also, in the current study, the correlation of educational levels and HRQOL was investigated, and the results showed no significant difference, except between general perception of health and education levels. More advanced analysis revealed a significant difference between two subgroups of education and HRQOL; primary school and diploma. Germin-Petrović et al. showed better HRQOL in higher educational level (24). Another survey by Gentile et al. revealed that low educational degree had an association with lessening HRQOL (25). These studies are consistent in providing incontrovertible impact of education on HRQOL in transplanted patients, this is perhaps due to stronger follow up after transplantation and their realistic approach, which precedes a lower expectation from their conditions. So the focus on training and having educational practice for transplanted patients to improve the QOL is recommended.

The results showed no significant relationship between the duration of facing disease and HRQOL, except in subgroup of role limitation due to physical problems. Also, a study reported that in diabetic patients, long duration of dialysis, as well as recent critical illness and hospitalization might decrease the scores HRQOL questionnaires (25). It seems that much research is required to establish the exact impact of length of facing disease on HRQOL.

Another item that was studied, was the type of organ transplantation, which was divided to three groups: cadaveric, unrelated living donor, related living donor. Results showed that in solid-organ transplant recipients, HRQOL improved most significantly over the first year after transplantation and remained relatively stable afterwards (26). Our results showed that related-living donor group had better HRQOL than other groups, although statistical analysis showed no significant differences among these three groups. Similarly, Arogundade et al. showed that different manners of donation had no significant difference in QOL (27). So, it seems that there is not any difference among various type of donors, so we can benefit from cadaveric donors in extended space.

5.1. Limitations and Suggestions

The population of our study was limited and some of the patients forgot their follow up visit, so an attempt was made to contact them in order to obtain the information. Some of the patients have low educational level and it took a great deal of time to explain the questionnaire to them, and in illiterate patients we had to interview them. Most of complications of transplantation's rejection, which affect HRQOL occurred within two to three months after transplantation, but this time is varied in different individuals. Moreover, late complications of rejection occur after 1 to 2 years. So, longer follow up is necessary to determine the exact effect of transplantation on HRQOL. It is recommended to conduct universal cost-effectiveness studies in a larger sample size for more reliability and generalizability to determine the role of RT in HRQOL of patients with ESRD.

5.2. Conclusions

HRQOL could be improved significantly after transplantation in all 8 scales. But no noticeable correlation was found between HRQOL and some demographic factors (gender, age, marital status, and type of transplantation donor), except relationship between level of education in two subgroups of primary school and diploma with general perception of health, as well as relationship between limitation due to physical role and length of disease. Moreover, continuous enhancement of education level and public knowledge might be as effective as developing medical serving systems in maintenance and achieving greater improvement in HRQOL.

Acknowledgments

The present article was extracted from the thesis for the degree of medical doctor with grant No. 3221, which was financially supported by Shiraz University of Medical Sciences. The authors thank the Vice-Chancellor for Research of Shiraz University of Medical Sciences for funding this research.

Footnotes

Conflict of Interests: All authors reported no conflicts of interest relevant to this article.

Ethical Approval: The study was approved by the Vice-Chancellor of Research and Technology, in addition to the local Ethics Committee of Shiraz University of Medical Sciences.

Funding/Support: Shiraz University of Medical Sciences (grant No. 3221).

Patient Consent: All patients who did not agree to complete the questionnaire form, uncompleted forms or refused written consent form were excluded from the study.

References

1. Aiyegbusi OL, Kyte D, Cockwell P, Marshall T, Gheorghe A, Keeley T, et al. Measurement properties of patient-reported outcome measures (PROMs) used in adult patients with chronic kidney disease: A systematic review. *PLoS One*. 2017;**12**(6). e0179733. doi: 10.1371/journal.pone.0179733. [PubMed: 28636678]. [PubMed Central: PMC5479575].
2. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: Evaluation, classification, and stratification. *Am J Kidney Dis*. 2002;**39**(2 Suppl 1):S1–266. [PubMed: 11904577].
3. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;**380**(9859):2095–128. doi: 10.1016/S0140-6736(12)61728-0. [PubMed: 23245604].
4. Lim HJ, Koo TY, Lee J, Huh KH, Park JB, Cho J, et al. Health-related quality of life of kidney transplantation patients: Results from the Korean cohort study for outcome in patients with kidney transplantation (KNOW-KT) study. *Transplant Proc*. 2016;**48**(3):844–7. doi: 10.1016/j.transproceed.2015.12.101. [PubMed: 27234749].
5. Rostami Z, Einollahi B, Lessan-Pezeshki M, Soleimani Najaf Abadi A, Mohammadi Kebar S, Shahbazian H, et al. Health-related quality of life in hemodialysis patients: An Iranian multi-center study. *Nephrourol Mon*. 2013;**5**(4):901–12. doi: 10.5812/numonthly.12485. [PubMed: 24350090]. [PubMed Central: PMC3842562].
6. Hadi N, Rahmani Z, Montazeri A. [Health-related quality of life in chronic renal failure patients receiving hemodialysis]. *Payesh*. 2010;**11**(3):349–54. Persian.
7. Esposito P, Furini F, Rampino T, Gregorini M, Petrucci L, Klersy C, et al. Assessment of physical performance and quality of life in kidney-transplanted patients: A cross-sectional study. *Clin Kidney J*. 2017;**10**(1):124–30. doi: 10.1093/ckj/sfw102. [PubMed: 28638612]. [PubMed Central: PMC5469555].
8. Ronai KZ, Szentkiralyi A, Lazar AS, Lazar ZI, Papp I, Gombos F, et al. Association of symptoms of insomnia and sleep parameters among kidney transplant recipients. *J Psychosom Res*. 2017;**99**:95–104. doi: 10.1016/j.jpsychores.2017.05.019. [PubMed: 28712436].
9. Brekke FB, Waldum-Grevbo B, von der Lippe N, Os I. The effect of renal transplantation on quality of sleep in former dialysis patients. *Transpl Int*. 2017;**30**(1):49–56. doi: 10.1111/tri.12866. [PubMed: 27696543].
10. Chilcot J, Guirguis A, Friedli K, Almond M, Day C, Da Silva-Gane M, et al. Depression symptoms in haemodialysis patients predict all-cause mortality but not kidney transplantation: A cause-specific outcome analysis. *Ann Behav Med*. 2018;**52**(1):1–8. doi: 10.1007/s12160-017-9918-9. [PubMed: 28762106]. [PubMed Central: PMC6367894].
11. Sommerer C, Zeier M. Reporting quality-of-life outcomes in clinical trials of immunosuppressive therapy in kidney transplantation. *Am J Kidney Dis*. 2016;**67**(5):722–3. doi: 10.1053/j.ajkd.2015.09.033. [PubMed: 27091014].
12. Giri M. Choice of renal replacement therapy in patients with diabetic end stage renal disease. *EDTNA ERCA J*. 2004;**30**(3):138–42. [PubMed: 15715116].
13. Ghods AJ. Renal transplantation in Iran. *Nephrol Dial Transplant*. 2002;**17**(2):222–8. doi: 10.1093/ndt/17.2.222. [PubMed: 11812870].
14. Ghods AJ, Abdi E. Dialysis and renal transplantation in Iran. *Acta Medica Iranica*. 1987;**29**(1-2):1–13.
15. Perez San Gregorio MA, Martin Rodriguez A, Diaz Dominguez R, Perez Bernal J. [Health related quality of life evolution in kidney transplanted patients]. *Nefrologia*. 2007;**27**(5):619–26. Spanish. [PubMed: 18045039].
16. Hays RD, Kallich JD, Mapes DL, Coons SJ, Carter WB. Development of the kidney disease quality of life (KDQOL) instrument. *Qual Life Res*. 1994;**3**(5):329–38. doi: 10.1007/BF00451725. [PubMed: 7841967].
17. Mapes DL, Bragg-Gresham JL, Bommer J, Fukuhara S, McKevitt P, Wikstrom B, et al. Health-related quality of life in the dialysis outcomes and practice patterns study (DOPPS). *Am J Kidney Dis*. 2004;**44**(5 Suppl 2):54–60. doi: 10.1053/j.ajkd.2004.08.012. [PubMed: 15486875].
18. Unruh M, Benz R, Greene T, Yan G, Beddhu S, DeVita M, et al. Effects of hemodialysis dose and membrane flux on health-related quality of life in the HEMO Study. *Kidney Int*. 2004;**66**(1):355–66. doi: 10.1111/j.1523-1755.2004.00738.x. [PubMed: 15200444].
19. Montazeri A, Goshtasebi A, Vahdaninia M, Gandek B. The short form health survey (SF-36): Translation and validation study of the Iranian version. *Qual Life Res*. 2005;**14**(3):875–82. doi: 10.1007/s11136-004-1014-5. [PubMed: 16022079].
20. Tayebi A, Raiesifar A, Ebadi A, Eynollahi B, Rafiyan Z, Keyvanloo F. Investigation of renal transplantation patients' quality of life by kidney transplantation questionnaire (KTQ-25). *Nurs Crit Care*. 2010;**3**(3):125–8.
21. Mini AM, Emmanuel J, Unni VN, Deepa AR, Aboobaker S. Evaluation of quality of life in hemodialysis and renal transplant patients. *J Pharm Sci*. 2010;**1**(2):77–83.
22. Rambod M, Shabani M, Shokrpour N, Rafii F, Mohammadalliha J. Quality of life of hemodialysis and renal transplantation patients. *Health Care Manag (Frederick)*. 2011;**30**(1):23–8. doi: 10.1097/HCM.0b013e3182078ab6. [PubMed: 21248544].
23. Rebollo P, Ortega F, Baltar JM, Diaz-Corte C, Navascues RA, Naves M, et al. Health-related quality of life (HRQOL) in end stage renal disease (ESRD) patients over 65 years. *Geriatr Nephrol Urol*. 1998;**8**(2):85–94. doi: 10.1023/A:1008338802209. [PubMed: 9893216].
24. Germin-Petrovic D, Mesaros-Devcic I, Lesac A, Mandic M, Soldatic M, Vezmar D, et al. Health-related quality of life in the patients on maintenance hemodialysis: The analysis of demographic and clinical factor. *Coll Antropol*. 2011;**35**(3):687–93.
25. Gentile S, Beauger D, Speyer E, Jouve E, Dussol B, Jacquelinet C, et al. Factors associated with health-related quality of life in renal transplant recipients: Results of a national survey in France. *Health Qual Life Outcomes*. 2013;**11**(1):88. doi: 10.1186/1477-7525-11-88. [PubMed: 23721430]. [PubMed Central: PMC3673846].
26. Prihodova L, Nagyova I, Rosenberger J, Roland R, Groothoff JW, Majernikova M, 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. [PubMed: 24553619].
27. Arogundade FA, Abd-Essamie MA, Barsoum RS. Health-related quality of life in emotionally related kidney transplantation: Deductions from a comparative study. *Saudi J Kidney Dis Transpl*. 2005;**16**(3):311–20. [PubMed: 17642798].