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Health-related quality of life in patients undergoing hemodialysis

Kvalitet života povezan sa zdravljem bolesnika koji se leče hemodijalizom

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Abstract

Background/Aim. Chronic renal disease is one of the growing problems all over the world. Health-related quality of life (HRQoL) is an important indicator for those with a chronic disease, such as chronic renal disease, because it may serve as predictor of mortality and hospitalization. The aim of this study was to assess HRQoL in patients on chronic maintenance hemodialysis (HD), and compare it with patients suffering from hypertension (HTA), and normal controls of the same age and gender (C). **Methods**. The study enrolled 224 males and females older than 18 years: 67 in the HD group, 78 in the HTA group, and 79 in the C group. HRQoL was assessed in all groups using 15-D questionnaire. **Results**. Significantly higher level of education was recorded in the HD group compared to other two groups. In the HD group there were significantly less employed persons (9%) and significantly more retired (67.2%). All groups were similar regarding an average monthly income and marital status. We found significantly lower total HRQoL score in patients in the HD group, compared to normal controls (0.78 ± 0.16 vs. 0.89 ± 0.10 in the HTA and 0.95 ± 0.06 in the C group) as well as specific scores in almost all investigated domains, except in speech, eating and mental functions. Patients in the HD and HTA groups had similar self-reported quality of life in additional 3 domains: hearing, elimination and distress, while the HD group reported significantly lower scores in remaining 9 domains: mobility, vision, breathing, sleeping, usual activities, discomfort and symptoms, depression, vitality and sexual activity. Patients in the HTA group had significantly lower scores than normal controls in 8 domains (hearing, sleeping, elimination, usual activities, discomfort and symptoms, depression, distress and vitality) as well as in total quality of life, while in remaining 4 domains there was no significant difference (mobility, vision, breathing, sexual activity). **Conclusion**. Both investigated chronic diseases lead to impairment of HRQoL, which is substantially stronger in hemodialysis than in hypertension. Considering the relationship between depression and HRQoL measures, it may be useful to treat depression of HD patients in order to improve their quality of life.

Key words:
renal dialysis; hypertension; quality of life; surveys and questionnaires; health.

Apstrakt

Uvod/Cilj. Hronična bubrežna bolest danas je sve više zastupljena širom sveta. Kvalitet života povezan sa zdravljem (HRQoL) predstavlja koristan pokazatelj u populacijama obolelih od hroničnih bolesti kao što je hronična bubrežna bolest, pošto može poslužiti kao pouzdan prediktor smrtnog ishoda i hospitalizacije. Cilj ove studije bio je da se ispita kvalitet života povezan sa zdravljem populacije obolelih od terminalne bubrežne insuficijencije koji se leče hroničnom hemodijalizom (HD) i da se uporedi sa populacijom obolelih od hipertenzije (HTA) i populacijom naizgled zdravih osoba iste starosne dobi i polne strukture (C). **Metode**. Studijom je obuhvaćeno ukupno 224 ispitanika starijih od 18 godina, oba pola: 67 u HD grupi, 78 u HTA grupi i 79 u C grupi. HRQoL je procenjivan u svim grupama korišćenjem 15-D standardizovanog upitnika. **Rezultati**. Ispitanici iz HD grupe imali su značajno više obrazovanje od ostale dve grupe. U HD grupi bilo je značajno manje zaposlenih (9%), a značajno više penzionera (67,2%). Grupe se nisu razlikovale u pogledu prosečnog mesečnog prihoda i bračnog stanja. Bolesnici u HD grupi imali su značajno niži ukupni HRQoL skor u poređenju sa ostalim grupama (0,78 ± 0,16 vs. 0,89 ± 0,10 u HTA i 0,95 ± 0,06 u C grupi), a takođe i niže specifične skorove u skoro svim preostalim aspektima kvaliteta života, osim u domenu govora, jela i mentalne funkcije, gde nije bilo razlike između grupa. Bolesnici iz HD grupe su zabeležili značajno niže skorove u odnosu na HTA grupu u sledećim domenima: pokretljivost, vid, disanje, spavanje, uobičajene aktivnosti, nelagodnost i simptomi, depresija, vitalnost i seksualna aktivnost, a slične u domenima: sluh, pražnjenje i duševna patnja. U HTA grupi

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zabeleženi su značajno niži skorovi u odnosu na C grupu u osam domena (sluh, spavanje, pražnjenje, uobičajene aktivnosti, nelagodnost i simptomi, depresija, duševna patnja i vitalnost, a u četiri domena rezultati su bili slični (pokretljivost, vid, disanje, seksualna aktivnost). **Zaključak**. Obe ispitivane hronične bolesti dovode do smanjenja kvaliteta života povezanog sa zdravljem, s tim da je smanjenje značajno intenzivnije u slučaju hemodijalize nego u slučaju hipertenzije. S obzirom na povezanost depresije i ostalih merila kvaliteta života, lečenje depresije bi moglo biti korisno za poboljšanje kvaliteta života bolesnika na hemodijalizi.

Ključne reči:
bubreg, dijaliza; hipertenzija; kvalitet života; ankete i upitnici; zdravlje.

Introduction

Health-related quality of life (HRQoL) refers to physical, psychological and social domains of health, influenced by one's personal experience, beliefs, expectations and perceptions of health [1]. Because of these aspects, it is possible that two persons with similar health conditions, report different quality of life [2, 3]. However, transfer of various aspects and domains of health into particular quantitative value is not simple [4]. In past twenty years, several methods were used as measurements of HRQoL in healthy population [5], as well as in various categories of chronic diseases [6–8]. Health-related quality of life (HRQoL) is important diagnostic instrument in population with chronic diseases, such as chronic renal diseases. It may serve as predictor of mortality and hospitalization, according to results of the large international study with the total of 17,236 patients on hemodialysis [9].

Chronic renal disease (CRD) is a global health problem. The incidence of CRD is growing and is present in 11% of world population. This may be related to higher prevalence of elderly, but also with increased frequency of obesity, diabetes and hypertension which are well-known risk factors for CRD development [10]. According to the World Health Organization, CRD takes the 12th place in leading causes of death [11].

End-stage renal disease requires replacement of kidney function with the active therapy – kidney transplantation, chronic ambulatory peritoneal dialysis, or maintenance hemodialysis (HD). It is expected not only to replace the insufficient renal function, but also to improve HRQoL. However, the chronicity of disease and HD treatment impose major restrictions regarding intake of food and water. Patients undergoing HD lose their freedom to some extent and become dependent on a health facility, which often influence their marriage, family and social life. HD often results in lower income, which is also one of the aspects of quality of life [12].

The estimation of HRQoL is very important for chronically ill people, since it is possible to evaluate the burden of chronic disease.

There are very few studies of HRQoL regarding patients on HD in Serbia [13].The difference between the HD and other chronic diseases regarding influence on HRQoL has not been established so far, including the effect of specific treatment, simply by comparison with healthy population [14]. The estimation of HRQoL in patients on HD may be performed by various questionnaires [4, 15–18]. 15-D instrument is a generic, self-reported, standardized questionnaire covering 15 domains, which provides data about life quality through scores [18]. It is simple and multidimensional, hence suitable for population undergoing HD.

The aim of our study was to evaluate the HRQoL in population on HD, and to compare it not only to healthy controls of the same age, but also to population with hypertension as different chronic disease.

Methods

The study enrolled 224 males and females older than 18 years: 67 with the end-stage renal failure undergoing in-center HD, 78 with chronic hypertension on regular medicament treatment (HTA), and 79 apparently healthy normal controls (C). Patients in the HD and HTA group were recruited from the Clinic for Nephrology and Outpatient Clinic of the Military Medical Academy in Belgrade, respectively. Normal controls were healthy blood donors and people on regular preventive examinations in several Health Centers in Belgrade. At the moment of investigation, no one had an acute or chronic disease, or was on a medical therapy. Subjects in the HTA and C groups were matched for age and gender to the HD group. Patients with the active systemic disease, inflammatory bowel disease, malignant diseases, pregnancy, any acute disease at the moment of investigation, psychiatric or neurological disorder that might influence the usual activities, as well as patients without permanent vascular access for hemodialysis were not included. Patients in the HD group were on hemodialysis more than 6 months. All of them underwent dialysis three times a week for approximately 4 hours (between 180–270 min), with the single use of polysulfone membrane, surface area from 1.3–2.4 m^2. Blood flow was 230–350 mL/min, and the dialysate flow was 500 mL/min. Bicarbonat dialysis solution was used in all dialysis procedures and HD adequacy was measured by Kt/V index. The average value was 1.52 ± 0.27. More than 80% patients were on erythropoiesis stimulating agent. The health-related quality of life was measured by self-reported generic instrument 15-D [4, 17]. It is a 15-item questionnaire that measures functions in various domains as: mobility, vision, hearing, breathing, sleeping, eating, speech, excrete elimination, usual activities, mental functions, discomfort and symptoms, depression, distress, vitality, and sexual activity. It is rated on a 5-point scale, with a total score range between 0 and 1 (higher score indicates better HRQoL). Demographic and socioeconomic characteristics were investigated by self-reported questionnaire. Investigation was approved by local Ethical Committee and was conducted during 2015.

Obtained data were presented as means ± standard deviation (SD) or proportions (%). Normality of distribution was tested by Kolmogorov-Smirnov test. Differences betwe-

en groups were analyzed by Kruskall-Wallis test and χ^2 test for categories with *post hoc* Mann-Whitney test. Statistical significance was accepted at $p < 0.05$.

Results

Demographic and socio-economic characteristics of participants in all 3 groups are presented in Table 1. There were no significant differences between groups in age, gender, income and marital status ($p = 0.101$, 0.577, 0.166 and 0.052, respectively). Average duration of renal disease in the HD group was 13.04 ± 11.29 years, of which 6.21 ± 6.74 years on dialysis. Average duration of hypertension in the HTA group was 15.08 ± 13.90 years.

Post-hoc statistical analyses were performed for education and employment, since other 4 characteristics showed no difference between groups. The results are presented in Table 2.

Significantly more participants with college or university degree were recorded in the HD group, compared to other two groups, where high school level of education was predominant ($p < 0.001$). There was also statistically significant difference between groups regarding employment status compared to other two groups: in the HD group there were significantly less employed persons (9.0% vs. 34.6% in the HTA and 65.8% in the C group), and significantly more retired (67.2% vs. 55.1% and 24.1%), respectively.

Average scores of particular domains obtained from 15-D questionnaire are presented in Table 3, together with statistical analysis of differences among all three groups. Results indicated that the groups had similar scores of quality of life only in domains of speech, eating and mental functions. In all other domains as well as in total quality of life score, there were statistically significant differences among the groups. The lowest scores were recorded in the HD, and the highest scores in the C group.

In order to investigate further differences among the groups, *post-hoc* tests were performed for 12 domains and the total score. Since the differences among the groups in speech, eating and mental functions were not significant these 3 domains were excluded from further analysis. The results are presented in Table 4.

Table 1

Demographic and socio-economic characteristics of participants

Category	HD (n = 67)	HTA (n = 78)	C (n = 79)	χ^2	*p*
Participants, n (%)					
males	41 (61.2)	44 (56.4)	51 (64.6)	1.101 (df = 2)	0.577
females	26 (38.8)	34 (43.6)	28 (33.4)		
Age (yrs), range					
mean ± SD	58.6 ± 15.6	60.6 ± 13.7	56.2 ± 14.9	4.611 (df = 2)	0.101
	21–86	21–82	22–86		
Education, n (%)					
elementary school or less	11 (16.4)	9 (11.5)	2 (2.5)	34.906 (df = 4)	< 0.001
high school degree	27 (40.3)	60 (76.9)	63 (79.7)		
College/University degree	29 (43.3)	9 (11.5)	14 (17.7)		
Employment, n (%)					
employed	6 (9.0)	27 (34.6)	52 (65.8)	55.979 (df = 6)	< 0.001
unemployed	10 (14.9)	2 (2.6)	4 (5.1)		
retired	45 (67.2)	43 (55.1)	19 (24.1)		
other	6 (9.0)	6 (7.7)	4 (5.1)		
Income (per person, monthly) RSD					
< 20,000	15 (22.4)	21 (26.9)	11 (13.9)	6.480 (df = 4)	0.166
21–40,000	30 (44.8)	33 (42.3)	47 (59.5)		
> 40,000	22 (32.8)	24 (30.8)	21 (26.6)		
Marital status, n (%)					
married/with partner	48 (71.6)	63 (80.8)	53 (67.1)	12.620 (df = 6)	0.052
single	13 (19.4)	10 (12.8)	16 (20.3)		
widowed	5 (7.5)	1 (1.3)	0 (0)		
divorced	1 (1.5)	4 (5.1)	10 (12.7)		

HD – hemodialysis group; HTA – chronic hypertension group; C – normal control group.
SD – standard deviation.

Table 2

***Post-hoc* statistical analysis of difference between groups (Pearson χ^2 test, df = 3)**

Characteristic	HD:C		HD:HTA		HTA:C	
	χ^2	*p*	χ^2	*p*	χ^2	*p*
Education	49.364	< 0.001	18.012	< 0.001	18.263	< 0.001
Employment	25.046	< 0.001	22.539	< 0.001	5.609	0.061

HD – hemodialysis group; HTA – chronic hypertension group; C – normal control group.

Compared to normal controls, patients on hemodialysis had statistically lower scores in all 12 domains as well as in total 15-D score. When compared to the HTA group significantly lower scores remained in 9 domains and in total 15-D score, while the HD and HTA groups were similar regarding self-reported quality of hearing, elimination and distress. Patients in the HTA group had significantly lower scores than normal controls in 8 domains and total 15-D score, while in domains of mobility, vision, breathing and sexual activity there was no significant difference between HTA and apparently healthy persons of the same age.

hemodialysis were able to breathe normally, comparing with 73.4% of subjects in the C and 60.3% in the HTA group ($p < 0.001$). Only 34.3% of patients in the HD group were able to sleep normally, comparing with 73.4% in the C and 48.7% in the HTA group ($p < 0.001$). Also, 56% of patients on hemodialysis and 64.1% in the HTA group reported normal functions of bladder and bowel, which is significantly lower ($p < 0.001$) than in the C group (83.5%). Serious problems with bladder and/or bowel function were present only in the HD group (14.9%). Only 25.4% of HD patients were able to perform usual activities, comparing with 87.3% in the C and

Table 3

Average scores of 15-D questionnaire domains in all groups

	HD	HTA	C	Kruskall-Wallis (df = 2)	*p*
Mobility	0.78 ± 0.27	0.95 ± 0.12	0.97 ± 0.08	37.38	< 0.001
Vision	0.79 ± 0.28	0.91 ± 0.17	0.94 ± 0.11	11.90	0.003
Hearing	0.89 ± 0.21	0.92 ± 0.13	0.98 ± 0.08	11.46	0.003
Breathing	0.74 ± 0.26	0.86 ± 0.19	0.92 ± 0.14	22.72	< 0.001
Sleeping	0.71 ± 0.28	0.81 ± 0.22	0.93 ± 0.13	29.59	< 0.001
Eating	0.97 ± 0.11	0.99 ± 0.04	1.00 ± 0.00	6.46	0.059
Speech	0.98 ± 0.07	0.98 ± 0.08	0.99 ± 0.06	0.47	0.789
Elimination	0.74 ± 0.32	0.86 ± 0.19	0.95 ± 0.12	18.50	< 0.001
Usual activities	0.59 ± 0.33	0.87 ± 0.19	0.95 ± 0.14	67.52	< 0.001
Mental functions	0.92 ± 0.18	0.91 ± 0.17	0.96 ± 0.11	4.85	0.089
Discomfort	0.77 ± 0.27	0.90 ± 0.16	0.96 ± 0.10	26.75	0.000
Depression	0.73 ± 0.25	0.83 ± 0.19	0.92 ± 0.14	24.50	< 0.001
Distress	0.78 ± 0.27	0.83 ± 0.22	0.93 ± 0.14	15.74	< 0.001
Vitality	0.68 ± 0.23	0.83 ± 0.18	0.93 ± 0.13	50.28	< 0.001
Sexual activity	0.54 ± 0.35	0.83 ± 0.18	0.91 ± 0.18	50.18	< 0.001
Total 15-D score	0.78 ± 0.16	0.89 ± 0.10	0.95 ± 0.06	65.70	< 0.001

HD – hemodialysis group; HTA – chronic hypertension group; C – normal control group.

Table 4

***Post-hoc* statistical analysis of difference between groups (Mann-Whitney test, df = 3)**

	HD:C		HD:HTA		HTA:C	
	Mann-Whitney	*p*	Mann-Whitney	*p*	Mann-Whitney	*p*
Mobility	1,604.00	< 0.001	1,714.00	< 0.001	2,912.50	0.284
Vision	1,967.00	0.001	2,079.00	0.012	2,917.50	0.446
Hearing	2,195.50	0.004	2,585.00	0.885	2,451.00	0.001
Breathing	1,607.50	< 0.001	1,925.00	0.003	2,637.50	0.058
Sleeping	1,429.50	< 0.001	2,083.00	0.025	2,213.00	< 0.001
Elimination	1,806.50	< 0.001	2,197.00	0.059	2,443.00	0.003
Usual activities	924.00	< 0.001	1,295.00	< 0.001	2,447.00	0.002
Discomfort	1,611.50	< 0.001	1,942.00	0.002	2,624.50	0.023
Depression	1,536.00	< 0.001	2,097.5	0.030	2,292.50	0.002
Distress	1,864.50	< 0.001	2,408.50	0.371	2,314.50	0.001
Vitality	1,037.00	< 0.001	1,660.00	< 0.001	2,133.50	< 0.001
Sexual functions	1,107.00	< 0.001	1,410.00	< 0.001	2,684.50	0.082
Total 15-D score	707.00	< 0.001	1,428.50	< 0.001	1,828.50	< 0.001

HD – hemodialysis group; HTA – chronic hypertension group; C – normal control group.

When we analyzed distribution of particular categories in each domain separately, we found further important differences: 91.1% of participants in the C group and 85.9% in the HTA group self-reported normal mobility, comparing with 53.7% in the HD group ($p < 0.001$); in the C and HTA groups 77.2% and 73.1% of subjects self-reported normal visual function, while in the HD group only 56.7% were in this category ($p = 0.002$); 92.4% of normal controls had normal hearing functions, which is significantly higher percentage comparing with the HD and HTA groups (76.1 and 71.8%, respectively; $p < 0.001$). Only 40.3% of patients on

66.7% in HTA group ($p < 0.001$). Moreover, 10% of HD patients were unable to manage any of previously usual activities, while this category was reported neither in the C, nor in the HTA group. In the HD group 49.3% patients were free of physical discomfort comparing with 86.1% in the C and 71.8% in the HTA group ($p < 0.001$). One patient in the HD group reported unbearable physical discomfort, and additional 7 (10.4%) severe discomfort. These categories were absent in other two groups. Totally, 69.6% in the C and 46.2% in the HTA group reported absence of sadness, melancholy or depression comparing with 34.3% patients in the HD gro-

up ($p < 0.001$). In the HD group 11.9% of patients described themselves as very said or extremely depressed. 53.7% in the HD and 55.1% in the HTA group had not have symptoms of distress, which was significantly lower than 78.5% in the C group ($p < 0.001$). Only 20.9% of patients in the HD group scored their vitality into highest category, comparing with 72.2% in the C and 43.6% in the HTA group ($p < 0.001$), while 11.9% in the HD group found themselves in category with lowest score. Finally, even 25.4% of patients in the HD group reported that their state of health makes sexual activity impossible, comparing with 1.3% in the C and 5.1% in the HTA group ($p < 0.001$), while only 28.4% in HD group stated that their health had no adverse effects on sexual life (comparing to 75.9% in the C and 65.4% in the HTA group).

Discussion

The health-related quality of life assessment is very important in patients with chronic diseases, because it provides an unique subjective measure of patient's perception of self well-being. Although subjective in nature, this perception may strongly influence the severity of disease, mortality rate and hospitalization [9]. Increasing proportion of elderly people in general population leads to increased incidence and prolonged duration of chronic diseases. Decrease in HRQoL in patients on HD is related to higher death rate [19, 20], depression and cognitive impairments [21–23] and malnutrition [24]. Depression is particularly strongly related to low HRQoL [21–23].

Several studies reported that HRQoL is particularly compromised in patients on hemodialysis [15, 25–28], which is confirmed with our results. Large study of HRQoL in 570 patients who underwent hemodialysis in 24 different centers revealed that, although dialysis is considered as a highly standardized procedure, there are clinically relevant differences in HRQoL among centers [29]. Taking that into account, we carried out our survey in one dialysis centre. Investigation conducted in Serbia by Stojanović and Stefanović [30] marked that poor income substantially reduce HRQoL in the HD patients. Socio-economic status in the HD patients in our study, however, was relatively maintained: their marital status and income did not differ from other two groups of the same age and gender. Notable differences were found in employment status (in the HD group there were more retired and less employed persons than in the HTA and C group) and education level (in the HD group there were more patients with the highest education level than in other two groups where high school levels were predominant). Higher education level is usually present in population with higher HRQoLs, but our results indicate that severity of disease and complexity of replacement therapy in the patients on HD are more important factors that influence HRQoL than the education level.

Early retirement may be the consequence of the major impairments in the physical aspect of HRQoL. When we analyzed specific scores, we found that only two domains of physical health were neither influenced by hemodialysis, nor by hypertension – eating and speech. In all 3 groups we recorded very high scores in these domains. The ability to eat normally is important in patients on hemodialysis, hence in this population malnutrition markedly influences mortality [24]. Patients in the HD group showed particularly low scores in other domains of physical health: mobility, vision, breathing and sexual activity. Only half of the HD patients were able to move indoors and outdoors and on the stairs. Moreover, 2 patients reported themselves as completely bed-ridden and unable to move about, while in the C and HTA group there was no one falling in this category. Similarly, only half of the HD patients reported normal visual function, i.e. that they can read without difficulties (with or without glasses). In this group we found 1 patient who was almost completely blind. Only 40% of the patients on hemodialysis were able to breathe normally, while every tenth reported shortness of breath, even after light activity. The lowest average score in the HD group was found in domain of sexual activity – as low as 0.54 ± 0.35. For one-quarter of these patients, state of health makes their sexual activity impossible. Hypertensive patients, on the other hand, reported scores in these physical domains as high as normal controls, but in domains of hearing, elimination and physical discomfort their scores were similar to the ones of the HD group, indicating that hypertension also influenced these aspects.

All subjects reported that their overall mental functions were not impaired (average score varied from 0.91 in the HD to 0.96 in the C group). However, when specific domains of mental health were analyzed, we found that depression was common in the HD group: only one-third of the patients were not melancholic or depressed. At the same time, every tenth of them reported being very sad, and 1 as extremely depressed. Symptoms of distress (anxiety, nervousness) were present in substantial percentage both in the patients on hemodialysis and those with hypertension. Hemodialysis had major influence on sleeping, too. Only one-third of the patients were able to sleep normally. Persons who suffered severe sleeplessness were recorded only in the HD group. They reported that sleeping was almost impossible even with full use of sleeping pills, so they stayed awake most of the night. Anxiety and insomnia were also often present in a study conducted on the population of 84 patients on hemodialysis in Greece (of similar age and social characteristics as in our study) [24]. Hypertensive patients in our study had less sleeping problems, but still not achieved the quality of sleeping reported in the control group.

Patients on hemodialysis had particularly low average score in the domain of vitality (0.68 ± 0.23). Only 20% reported themselves as healthy and energetic, while more than 10% categorized themselves as very weary and 1 patient as extremely weary, and totally exhausted. Hypertension also influences vitality, although to less extent.

Having usual activities imposed extreme difficulties to patients on hemodialysis. Only one-quarter of them managed to keep their jobs, or to study, perform usual housework and participate in free-time activities. Hypertensive patients were more successful in keeping such activities, but still less successful than the normal controls of the same age.

Health-related quality of life in patients on hemodialysis is markedly lower than in healthy population of the same age and socio-demographic characteristics, which

was proved in several studies [26, 27]. However, the difference between patients on hemodialysis and patients who suffer from other chronic long-lasting disease such as hypertension has not been investigated so far. Nevertheless, results we obtained from the hypertensive group may be compared to a study conducted on 121 hypertensive patients in Serbia [31]. The author evaluated their HRQoL using 15-D instrument and reported lower average 15-D score (0.76 ± 0.15) than in our study (0.89 ± 0.10). The differences may be explained by older age in later study (69.3 years compared to 58.1 in our study), since the same author observed that quality of life in all domains decreased with age. Similar to our study, speech and eating were not affected by hypertension (the results were in the range of basic levels).

Conclusion

Both investigated chronic diseases lead to impairment of HRQoL, which is substantially stronger in hemodialysis than in hypertension. Considering the relationship between depression and HRQoL measures, it may be useful to treat depression in population of the HD patients, in order to improve their quality of life.

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