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# The functioning of patients on haemodialysis. Age as the main determinant of functional condition

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## ABSTRACT

**Introduction.** Chronic kidney disease (CKD) is a progressive disease, and in spite of the progress of medicine, the care of specialized medical staff, and the patient's efforts, many of them develop its end-stage. The use of renal replacement therapy, haemodialysis, has provided patients with an opportunity to prolong their life, but due to complications, it leads to the deterioration in the quality of life.

**Aim.** To identify factors affecting the functioning of haemodialysis patients.

**Materials and methods.** The study involved 98 patients on haemodialysis, 37 women and 61 men. The average age was  $59.65 \pm 15.51$  years. The research tool was the Barthel Index, IADL and ESAS-R scale, i.e. a scale of experiencing symptoms that may be associated with haemodialysis.

**Results.** The mean renal replacement therapy period was  $42.76 \pm 50.30$  months. The most common cause of haemodialysis was chronic glomerulonephritis (21.43%), diabetic nephropathy (18.37%), polycystic kidney disease (12.24%) and hypertensive nephropathy (9.18%). In the study group, the average score on the Barthel Index scale was  $90.10 \pm 14.82$ , while the IADL score was  $20.24 \pm 4.72$  points. Women showed a slightly higher ability in basic and complex daily living activities. People up to 60 years of age showed a slightly higher ability. According to the ESAS-R scale (7–10 points), fatigue and drowsiness were the most intense symptoms. People older than 60 years of age more often experienced pain ( $p = 0.048$ ), malaise ( $p = 0.203$ ), appetite disorders ( $p = 0.232$ ), other problems ( $p = 0.042$ ).

**Conclusions.** In spite of their older age, the patients showed quite good motor skills. The differences between men and women in the assessment of the severity of somatic symptoms slightly disappear in the elderly. Women showed a slightly higher ability in both basic and complex daily living activities. Older people experience more haemodialysis-related symptoms.

**Key words:** functional ability, haemodialysis

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## Introduction

Chronic kidney disease (CKD) is currently a serious health problem due to the ever-growing number of patients and the high risk of complications and death. It is estimated that ca. 600 million people around the world currently suffer from CKD, with about 4.2 million in Poland [1]. On the basis of the research carried out under the programs PolNef, POLSENIOR, NATPOL-11 and others, the frequency of occurrence of CKD in Poland is estimated at around 10% [2, 3]. As the incidence increases, the number of patients on haemodialysis is gradually increas-

ing. Among patients with CKD, those on haemodialysis constitute 18% in the United States, 13% in Europe and Japan, and 56% in other parts of the world [4]. In developed countries, this percentage is gradually stabilizing, which may be partly due to the earlier detection of CKD and the implementation of nephroprotective activities [2, 5]. Chronic kidney disease, like any other chronic disease, affects the daily functioning of the patient, his or her social, professional and family life. They often face social and financial problems because the disease and the therapy associated with it do not allow them to maintain their professional activity. Many patients experience anxiety

disorders, depression, and sleep disorders. In addition, nausea, malnutrition, dyspnoea, and severe somnolence occur, which further intensifies stress. Improving the mental condition of haemodialysis patients has a very positive effect on their physical condition [6–9]. Maintaining ability and independence is essential not only for the general well-being of patients and the effects of treatment, but it is also a significant factor in reducing the number of complications, recurrent hospitalizations, and even mortality in haemodialysis patients [10, 11]. Haemodialyses additionally hinder the fulfilment of psycho-social needs, force changes in professional and, often, life plans, make the patient dependent on medical devices and pharmacotherapy [6–8, 12]. Thus, functional dependence is a state of reduced physical ability in which a haemodialysis person is unable to perform tasks often considered basic in daily living.

Matching the choice of a renal replacement technique to the expectations of the patient alone undoubtedly contributes to the improvement of his or her functioning [14]. However, haemodialysis patients are characterized by varying degrees of functional ability compared to the general population [15]. Currently, an increasing level of functional activity in patients with ESRD is observed in both retrospective and prospective studies [16, 17].

### Aim

To identify factors affecting the functioning of haemodialysis patients.

## Material and methods

The sample consisted of 98 people treated with haemodialysis in two renal replacement therapy centres in the city of Poznań.

### Organization of the study

The conduct of the study was approved in only 2 out of 4 centres offering haemodialysis treatment. Each time, patients were informed in detail about the purpose of the study, and its tools were discussed. Eventually, 105 people participated in the study, with 7 questionnaires being rejected due to missing answers or to patient withdrawal. The condition of participation in the study was the patient's consent, a psychophysical condition enabling the self-completion of questionnaires, and the absence of other debilitating diseases.

The study was conducted between February and June 2013.

Inclusion criteria:

- haemodialysis treatment for at least 6 months.
- no other significantly functionally debilitating conditions.

### Research tools

1. A questionnaire for gathering demographic and clinical data
2. Barthel Index of Activities of Daily Living (Barthel Index) — a scale of 0 to 100 points. Patients with a score of above 86 are regarded in good functional condition, while a score below 20 means severe impairment.
3. Instrumental Activities of Daily Living Scale (IADL) — the version with 9 questions, with 3 options of answers was used: 1 point means full dependence, 2 points — partial dependence, and 3 — independence. Maximum total score is 27 points.
4. Edmonton Symptom Assessment System (revised edition) — ESAS-R.

The scale contains 10 questions about the severity of the experienced symptoms/ailments that can accompany haemodialysis: pain, fatigue, drowsiness, nausea, appetite, dyspnoea, depression, nervousness, the general feeling, other problems (e.g. constipation). The answer range is within 0 pts. — no ailments, above 10 pts. — maximum severity. Each symptom is analysed separately.

### Statistical analysis

The analysis was performed using IBM SPSS Statistics. Differences between two independent groups were evaluated using the t-Student test or non-parametric Mann-Whitney test. Correlations were assessed using Spearman's  $r_s$  rank correlation coefficient. Nominal variables were analysed using Pearson's chi-squared test. All the tests were considered statistically significant at  $p < 0.05$ .

The two-factor analysis of variance was also applied. Age as a variable affecting the functioning of patients on haemodialysis was taken into account in each analysis, and the other variables were added to it.

Taking into account the average age of the respondents, further analyses were performed allowing for two age groups: up to 60 and over 60 years of age. Considering the mean dialysis period, two groups were distinguished, i.e. up to 48 months and above. Marital status was analysed in the groups: married, single (other people).

## Results

### Demographics and clinical data

There were 61 men (62.24%) and 37 women (37.76%) aged 18–85 in the study group. The average age was  $59.65 \pm 15.51$  years. The median was 62 years.

In the study group, 67 people (68.37%) were married. 12 people (12.24%) lived alone mainly because of widowhood. 1/3 of the group had graduated

**Table 1.** Demographic and clinical data of the study group

Demographic and clinical data	Male sex		Female sex		Total	
	No.	[%]	No.	[%]	No.	[%]
	<b>61</b>	<b>62.24</b>	<b>37</b>	<b>37.76</b>	<b>98</b>	<b>100</b>
<b>Age</b>						
< 60 years	29	47.54	21	56.76	50	51.02
> 60 years	32	52.46	16	43.24	48	48.98
Average age	59.87 ± 16.69		59.30 ± 13.55		59.65 ± 15.51	
<b>Marital status</b>						
In a relationship	46	46.94	21	21.43	67	68.4
Single	10	10.20	5	5.10	15	15.3
Widowed	2	2.04	10	10.20	12	12.2
Divorced	3	3.06	1	1.02	4	4.1
<b>Education</b>						
Primary	11	11.22	8	8.16	19	19.39
Vocational	16	16.33	16	16.33	32	33.67
Secondary	25	25.51	10	10.20	35	35.71
Higher vocational (bachelor's degree)	3	3.06	–	–	3	3.06
Higher university (master's degree)	–	–	3	3.06	–	–
Academic title	5	5.10	–	–	8	8.16
	1	1.02	–	–	1	1.02
<b>Professional activity</b>						
Full-time employed	3	3.06	1	1.02	4	4.08
Part-time employed	1	1.02	1	1.02	2	2.04
Farmer	4	4.08	–	–	4	4.08
Retired	31	31.63	18	18.37	49	50.00
Pensioner	21	21.43	14	14.29	35	35.71
Student	1	1.02	–	–	1	1.02
Unemployed	–	–	3	3.06	3	3.06
<b>Having children</b>						
Yes	51	–	29	–	80	81.60
No	10	–	8	–	18	18.40
<b>Economic situation after falling ill</b>						
No change	47	47.96	26	26.53	73	74.49
Better	2	2.04	2	2.04	4	4.08
Worse	12	12.24	9	9.18	21	21.43
<b>Dialysis therapy period</b>						
up to 48 months	48	78.69	27	72.97	75	81.63
above 48 months	13	21.31	10	27.03	23	12.64
Average period	–		–		42.76 ± 50.30 months	

from high school (33.67%) and vocational school (32.66%). Retired people (50.00%) constituted a half of the group, followed by another dominant group of pensioners (35.71%). Only 6 people (6.12%) worked professionally. 80 respondents (81.60%) had children. 21 people (21.43%) realized that their economic situation deteriorated after haemodialysis had been started. The mean renal replacement therapy period was 42.76 ± 50.30 months. The shortest period was 6 months, the longest 312 months (Tab. 1). The most common causes of haemodialysis included: chronic glomerulonephritis (21.43%), diabetic nephropathy (18.37%), polycystic kidney disease (12.24%), and hypertensive nephropathy (9.18%).

### Functional condition

In the study group, the average Barthel Index score was 90.10 ± 14.82, while in IADL it was 20.24 ± 4.72 points. (Tab. 2). Women showed slightly higher, although statistically insignificant ability in terms of basic as well as complex daily living activities. In general, the group with an average of 59.65 years of age showed relatively good motor skills.

There was a statistically significant difference between age and self-dependence in basic and complex daily living activities ( $p < 0.05$ ). People up to 60 years of age showed slightly higher ability. Despite the observed differences in the functioning of people depending on education, a statistically significant difference was found

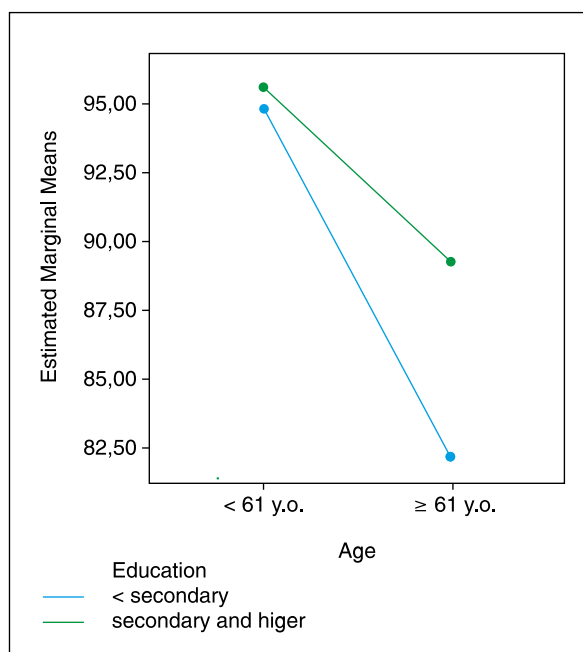
**Table 2.** Functional ability

Variables	Barthel Index avg. pts.	IADL avg. pts.
<b>Sex</b>		
Male	89.6 ± 14.6	20.3 ± 4.7
Female	90.9 ± 15.3	20.7 ± 3.9
Student's t-test	-0.437	-0.459
df	96	96
significance of p	0.663	0.647
<b>Age</b>		
< 60 years	95.1 ± 12.6	22.3 ± 3.3
> 60 years	84.9 ± 15.3	18.5 ± 4.5
Student's t-test	3.531	4.829
df	96	96
significance of p	0.001	0.000
<b>Education</b>		
< Secondary	87.5 ± 16.4	19.8 ± 4.8
Secondary and higher	92.9 ± 12.5	21.1 ± 3.8
Student's t-test	1.736	-1.446
df	96	96
significance of p	0.060	0.151
<b>Marital status</b>		
Married	90.4 ± 14.0	20.3 ± 4.3
Single	89.8 ± 17.1	20.7 ± 4.6
Student's t-test	-0.186	0.412
df	96	96
significance of p	0.852	0.681
<b>Dialysis period</b>		
up to 48 months	89.5 ± 15.6	20.2 ± 4.6
> 48 months	92.0 ± 12.1	20.4 ± 5.1
Student's t-test	-0.823	0.356
df	96	96
significance of p	0.412	0.722

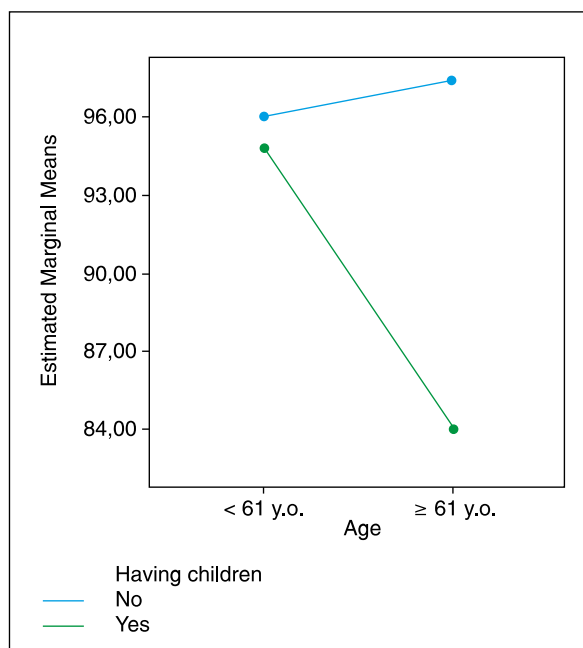
only in terms of IADL. People with higher education were more able and obtained higher scores in both the Barthel Index and IADL (Fig. 1).

Having children significantly diversified the respondents' ability in basic daily living activities (Barthel Index = -2.122, df = 96, p = 0.043). Childless patients showed higher ability (Fig. 2). However, having children did not diversify ability in terms of IADL (t = 1.494, df = 96 p = 0.139).

The two-factor analysis of variance was used to determine whether age and sex (F = 0.298, p = 0.586), age and education (F = 1.310, p = 0.255), and age and the fact of having children (F = 2.329, p = 0.130), diversify the level of self-dependence in terms of the Barthel Index. No difference between the analysed factors and the respondents' degree of ability was found. A detailed analysis showed that only age differentiates the state of ability in terms of basic daily living activities. In addition, as shown in Figures 1 and 2, in the group of older people, respondents with higher education and not having children showed higher levels of ability.



**Figure 1.** Estimated marginal means of index Barthel



**Figure 2.** Estimated marginal means of index Barthel

**Assessment of symptom severity — ESAS-R scale**

Of the 10 analysed ailments, the most severe (7–10 points) included fatigue and drowsiness. These symptoms occurred with such intensity in 18.37% of the respondents. The least intensive symptoms were nausea (in 92.86%), depression (in 84.69%),

**Table 3.** Assessment of symptom severity — ESAS-R scale

ESAS-R areas	sex* Correlation coefficient and significance level	education** Correlation coefficient and significance level	age*** Correlation coefficient and significance level	dialysis period*** Correlation coefficient and significance level
Pain	0.704 p = 0.483	0.953 p = 0.343	0.268 p = 0.008	0.205 p = 0.043
Fatigue	0.705 p = 0.483	2.116 p = 0.037	0.194 p = 0.056	0.091 p = 0.374
Nausea	-0.147 p = 0.883	0.500 p = 0.618	0.000 p = 0.997	0.000 p = 0.999
Depression	-0.608 p = 0.545	-0.098 p = 0.922	-0.171 p = 0.093	0.149 p = 0.143
Anxiety	-0.215 p = 0.830	0.047 p = 0.963	0.039 p = 0.706	0.322 p = 0.001
Somnolence	0.293 p = 0.770	0.580 p = 0.564	0.120 p = 0.241	0.175 p = 0.085
Appetite	-2.014 p = 0.050	2.098 p = 0.039	-0.217 p = 0.032	0.273 p = 0.006
General feeling	-0.560 p = 0.577	2.003 p = 0.048	-0.113 p = 0.267	0.296 p = 0.003
Dyspnoea	-1.419 p = 0.161	2.300 p = 0.024	-0.099 p = 0.334	0.269 p = 0.007
Another problem	0.854 p = 0.395	-0.903 p = 0.369	0.284 p = 0.005	-0.077 p = 0.451

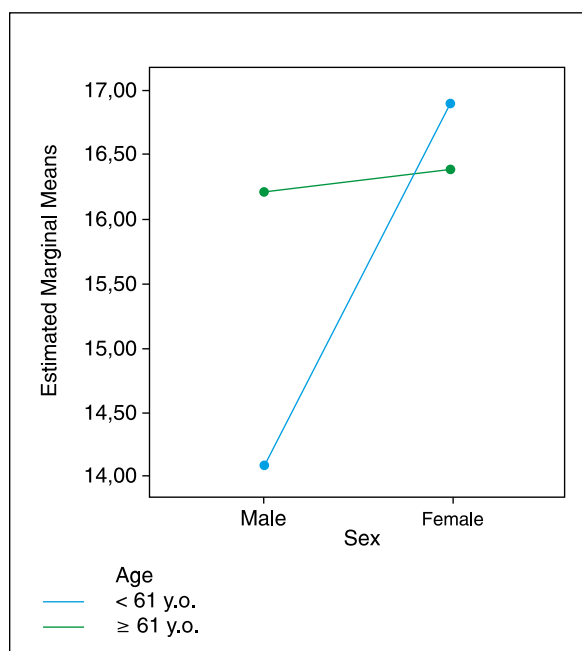
\* Student's t-test; \*\* Spearman's  $r_s$  correlation coefficient; \*\*\* Pearson correlation

dyspnoea (in 83.67%), and other problems, e.g. constipation (in 76.53%). Taking into account sex (Tab. 3), a statistically significant difference in experiencing symptoms was found only in appetite disorders (Student's t-test  $t = -2.014$ ,  $df = 96$ ,  $p = 0.05$ ). More often the disorder occurred in women (M 24.59%; F 32.43%).

The respondents' age correlated with the experience of pain (Spearman's test  $r = 0.267$ ,  $p = 0.008$ ), appetite disorders ( $r = -0.202$ ,  $p = 0.046$ ), and other problems ( $r = 0.316$ ,  $p = 0.002$ ). Older people experience more symptoms. Having children was statistically significantly related to feelings of fatigue (Student's t-test  $t = 1.908$ ,  $df = 96$ ,  $p = 0.059$ ) and nausea (Student's t-test  $t = 2.226$ ,  $df = 96$ ,  $p = 0.028$ ). Childless people experience these ailments to a lesser extent.

In addition, the level of education differentiated the feeling of fatigue ( $p = 0.037$ ) and general feeling ( $p = 0.050$ ). The duration of renal replacement therapy correlated with appetite ( $p = 0.006$ ), dyspnoea ( $p = 0.007$ ), and anxiety ( $p = 0.001$ ). The longer the dialysis therapy period, the higher the severity of the symptoms (Tab. 3).

**The two-factor analysis of variance** showed no difference between the severity of the symptoms (average) and the age and sex of the patients analysed at the same time (Anova  $F 0.212$   $p > 0.646$ ). However, it can be observed that differences between men and women in the assessment of the severity of somatic symptoms are slightly less pronounced in the elderly. The two-factor analysis did not show any differences in experiencing symptoms while at the same time taking into account age and education ( $F 0.134$   $p = 0.716$ ) and age having children ( $F 1.094$   $p = 0.298$ ) (Fig.3).

**Figure 3.** Estimated marginal means of ESAS SUM

### The ESAS-R scale and the functional condition

Correlation between the ability to perform basic daily living activities (Barthel Index) and the severity of pain ( $p = 0.000$ ), fatigue ( $p = 0.001$ ), appetite ( $p = 0.009$ ), general feeling ( $p = 0.009$ ), other problems ( $p = 0.000$ ) was confirmed using Spearman's  $r_s$  correlation coefficient. Correlation between the independent performance of complex daily living activities (IADL), and the severity of ailments such as pain ( $p = 0.003$ ), appetite ( $p = 0.009$ ), general feeling ( $p = 0.034$ ), the

other problems ( $p = 0.000$ ) was also confirmed using Spearman's  $r_s$  correlation coefficient.

## Discussion

Acceptance of the disease allows the patient to function properly despite the many dangers, limitations and problems associated with the loss of his or her health. Awareness of the causes and effects of the disease, as well as the knowledge of possible complications, allows patients' effective self-control and pro-health behaviour to improve the quality of, and prolong their lives [18]. Our survey showed the respondents' fairly good functional ability (Barthel Index 90.10 points, IADL 20.24 points). Similar results were obtained by Kapa-Skrzypczak et al., who claimed that 25 dialysis patients (62.5%) declared their full ability to perform complex daily living activities (IADL) such as vacuuming, shifting a table, lifting or carrying shopping, bathing, and getting dressed. Only 4 respondents (10%) required assistance in all housework activities, and 11 respondents (27.5%) showed limited independence with regard to bathing and getting dressed [14]. A similar trend was observed by Jassal et al., who found that dialysis patients had full ability in using the telephone (91%), in drug preparation and administration (84%), and money management (81%). The respondents required the most assistance in doing housework and laundry (21%) [13]. It should be stressed that patients functional independence have been supported in other studies. The results from both our own research and from the cited studies show that patients with ESRD, who are more functionally able, are also generally younger, in better health, generally feel better, and are more likely to assess their disease better than those who are less functionally able [19–21].

Patients with chronic kidney disease aged 18–85, treated using haemodialysis, were included in our own study. The analysis of collected data confirmed that the respondents up to 60 years of age functioned better in terms of basic and complex daily living activities. Younger people, most often due to the shorter illness period and fewer complications, tend to be more satisfied with their health, especially in the somatic sphere [19–24]. The quality of life, health perception, and social relationships deteriorate with age [25]. Oliwier et al. [26] observed worse functioning ( $p = 0.000$ ) and malaise ( $p = 0.005$ ) already in a group slightly younger ( $54.71 \pm 14.12$  years) than our respondents.

In our own study, the mean renal replacement therapy period was  $42.76 \pm 50.30$  months. The largest group of 75 people (81.63%) consisted of patients on haemodialysis for up to 48 months. The longer the dialysis period, the greater the severity of the symptoms,

and the worse the functional ability. Similar results were obtained by other authors claiming that, during haemodialyses, the functional ability of patients with end-stage renal disease deteriorates with time and with the occurrence of haemodialysis-related nuisances [27, 28].

Sex was not a significant determinant of the functional condition in our study. In other studies, women were less psycho-physically functional. They more often developed side effects of haemodialysis and showed lower mood, and more frequent fatigue [26].

The increased severity of experienced disease-related ailments and emotional lability are often the cause of a poorer assessment of the quality of life among women [29]. Also, haemodialysis patients who experience symptoms of depression and anxiety more often assess their quality of life worse and demonstrate poorer functioning [30, 31].

Authors of studies conducted in developing countries drew attention to the link between motor skills, sex, and the quality of life [29, 32]. Women also assessed their quality of life worse. Rarely undertaken social and motor activity, due to the lack of acceptance of the disease, was the most common cause of decreased quality of life as compared to men [25, 29, 33].

Another factor of importance in this study was the importance of education and having children. In the elderly group, higher levels of ability were reported by people with higher education and being childless. Links between functional ability and quality of life on the one hand, and education on the other, are confirmed in other studies [29, 34, 35]. For example, people with higher education assessed their quality of life generally better, which was associated with professional satisfaction, self-dependence and financial independence [34]. Zyoud et al. [29] also point out that people with higher education are better acquainted with the specific nature of the disease and its complications, which also results in a better relationship with the health care team.

Another factor of importance in this study were the types and severity of symptoms found in haemodialysis patients. The most common symptoms included fatigue and drowsiness, while nausea, depression, dyspnoea, and others, e.g. constipation, were the rarest. Older people suffered from more symptoms. Similar results were obtained by Kapa-Skrzypczak et al. [14]. In their study, the most common ailments were: pain (80%), chronic fatigue (67.5%), sleep disorders (50%), diarrhoea or constipation (40%), lack of appetite (40%), vomiting (36.7%), dyspnoea (15%) [14]. However, other studies have shown that the physical symptoms of the disease, with the exception of chronic fatigue and drowsiness, are not significantly increased. The low severity of symptoms probably also affected better functional ability and resulted in a better understanding of the disease [36, 37]. Moreover, as documented by others,

haemodialysis patients are more susceptible to stress, depression, and are more emotionally responsive than healthy people. Improving the mental condition of patients on haemodialysis has a positive effect on their physical condition [36, 38].

## Conclusions

In spite of their older age, the patients showed good functional ability. Age was the main factor affecting the ability of the elderly in terms of basic and complex daily living activities. Women and, in the group of older people, also patients with higher education and having children, showed slightly higher ability in terms of basic as well as complex daily living activities. Older people experience more haemodialysis-related symptoms.

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