

## Assessment of stress level and prevalence of depression among haemodialyzed patients

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**Summary Background.** Chronic Kidney Disease is a progressive illness that requires long-term treatment. Frequent hospitalisation due to dialysis is a result of multiple stressors which contributes to depressive disorders.

**Objectives.** The aim of this study was to assess the increase of stress and occurrence of depressive disorders among patients haemodialyzed regarding sociometric and medical data.

**Material and methods.** The study was carried out in a group of 102 patients with Chronic Kidney Disease who were subjected to haemodialysis in Koszalin, Poland. The study was conducted using the diagnostic poll method and standardised research tools: Perceived Stress Scale (PSS-10) and Beck's Depression Inventory.

**Results.** A positive correlation between an increase in stress and depression has been proven ( $r = 0.601$ ). Depression has been much more frequent among patients with a greater increase in stress ( $p = 0.001$ ). Data analysis indicates that among all the considered sociodemographic variables, only financial situation considerably contributes to an upsurge in anxiety ( $p = 0.001$ ). It has been established that pain ( $p = 0.001$ ) and self-sufficiency for daily activities ( $p = 0.007$ ) are factors in an increase of the stress experienced. Additionally, it has been concluded that there is a statistically relevant relationship between patients' gender and the prevalence of depression.

**Conclusion.** A majority of the patients treated with haemodialysis are characterised with mild depression and high levels of anxiety. Particular attention should be paid to patients with severe pain and low self-sufficiency, since they are more likely to experience stronger anxiety and more severe depression. Female, geriatric and financially troubled patients are susceptible to depression.

**Key words:** renal dialysis, anxiety, depression, patient.

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### Background

Chronic kidney disease is not only a clinical problem, but also a serious social issue. Similarly, just like other chronic diseases, it is recognised as a lifestyle disease. Incidence rate varies between countries. The average incidence amounts to around 10% and shows a growing tendency. It is estimated that the number of patients worldwide may range from 382 to 872 million, including from 2.7 to 6.2 million patients in Poland [1]. Chronic kidney disease is a progressive sickness lasting many years, which often requires renal replacement therapy. The therapy often leads to experiencing mental and physical discomfort. Additionally, it disrupts one's social and spiritual spheres. The patient is exposed to great stress, from the initial stage of diagnosing, throughout long-term treatment and, finally, in the end-stage renal replacement therapy carried out by means of haemodialysis [2].

The need to adapt to long-term treatment and frequent hospitalisation due to haemodialysis, often indefinitely, inflict considerable stress on the patient, forcing him or her to make sacrifices and show discipline, thus causing negative emotions, contributing to development of depressive disorders and negatively affecting sleep and appetite [3, 4].

Both acute and chronic stress, combined with exposure to negative experiences, may be one of the crucial elements increasing the risk of mental and somatic diseases. A close link between stress and the development of depression has been established. Currently, depression is believed to be a disorder with multifactorial aetiology, including genetic, biological and

psychosocial factors. An underlying assumption behind the aetiology of depression, inter alia, is that individuals genetically predisposed to a specific psychological disorder may develop depression due to negative or stressful life experiences. Other factors which contribute to the development of depressive disorders are incorrect cognitive constructs arising from social learning and certain personality traits [5–7].

Additionally, biological agents which are accountable for chronic kidney disease, such as cytokines, deregulation of stress (hypothalamic–pituitary–adrenal, HPA) axis, imbalance of glucose and insulin homeostasis, as well as oxidative stress and raised inflammatory markers among haemodialyzed patients, may cause depression [7]. Difficult, long-term therapy affects the quality of life and requires patients to alter their way of living, impairs daily life activity and interferes with self-esteem and the sense of self-identity, which causes a loss of adopted social and professional roles. These are some of the numerous psychosocial factors that may contribute to developing depression at any stage of chronic kidney disease [4, 8, 9].

### Objectives

The aim of this study was to assess the level of stress and prevalence of depression among haemodialyzed patients with regard to sociometric and medical data. Our goal was to determine if gender, age, educational attainment, professional status, place of residence, financial situation, self-sufficiency in



performing daily activities and disease knowledge level are associated with an increase in stress and depression among haemodialyzed patients. We assumed that respondents' gender has a significant influence on the prevalence of depression.

## Material and methods

### Setting

The studies were conducted between May and August 2017 in the Nephrocare Dialysis Centre in Koszalin, Poland following authorisation by the Medical Director.

### Participants

The study involved 102 patients with CKD who were subjected to haemodialysis. The inclusive criteria for participation of the patient was the patient's consent to participate in the study. The participants were informed about the aim of the study, the way of completing the questionnaire, anonymity of collected data and their voluntary participation. The basis for excluding a patient from the study was failure to understand the questionnaire due to cognitive impairment and any clinical condition preventing a response. Most respondents answered verbally to the questions from the questionnaire read aloud by the interviewer, and some patients filled in the questionnaire autonomously as instructed. In each case, the form was completed before haemodialysis. On average, it took 20 minutes to complete the questionnaire.

The study group was diverse in terms of gender. More than half (57.84%) of the respondents were men (59 persons), while 42.16% of the respondents were women (43 persons). The patients' age ranged between 29 and 89 years, with the average being 63.5 years of age.

### Measurement

The study was conducted using the diagnostic poll method with the author's questionnaire form. It was conducted using the diagnostic poll method and standardised research tools. The author's form consisted of 15 questions which concerned sociodemographic data and medical factors.

To evaluate the level of stress related to one's life situation over the last month, the Perceived Stress Scale (PSS-10) was used. It comprises 10 statements concerning various subjective experiences related with personal problems, behaviours and coping mechanisms. The overall result is a sum of total points where the theoretical distribution ranges from 0 to 40. The higher the score, the greater the intensity of stress perceived. After modification to standardised units, the overall rate is subjected to interpretation in accordance with sten scores. Results within 1–4 sten are treated as low results; on the other hand, results within 7–10 sten are interpreted as high. Results within 5 to 6 sten are treated as average [10].

The second scale used was Beck's Depression Inventory, which enables an assessment of the most common symptoms of depression on a four-level scale. The scale consists of 21 questions, for which one could get a total of 63 points. Each question has four possible answers. Each answer is differently assessed. The following answers correspond with increased symptoms intensity and are scored accordingly between 0 and 3. The following cut-off scores were as follows: 0–11 indicates: lack of depression, 12–19 indicates: mild depression, 20–25 indicates: moderate depression, 26–63 indicates: severe depression [11, 12].

### Statistical methods

The acquired information was used in the quantitative, percentile and statistical analysis. An assessment of the compliance of quantitative characteristics with normal distribution

was performed using the Shapiro–Wilk test. In the case of non-normal distribution, we used Spearman's correlation coefficient, which measures the strength and direction of association between two ranked variables. For two or more groups, the chi-square test was performed. All calculations were performed using the IBM SPSS (version 22) program.  $p < 0.05$  was adopted as statistically significant.

The study was conducted in accordance with ethical standards and the Declaration of Helsinki. The protocol was approved by the Bioethical Committee of the Pomeranian Medical University, Szczecin, Poland (approval number KB-0012/219/06/16).

## Results

### Participants and descriptive data

The study group consisted of 102 undergoing haemodialysis, most of whom completed secondary education (35.3%), reported being retired (58.8%), married or partnered (64.7%) and living in towns of more than 100,000 inhabitants (43.1%). The majority of patients described their financial situation as average (44.1%).

### Main results

The duration of therapy ranged between 3 months and 31 years, 6 years on average. Only one patient underwent haemodialysis 4 times a week, while the rest of the patients were subjected to the procedure 3 times a week. 71.6% of patients complained of pain varying in frequency. A majority of participants (59.8%) reported that they were self-sufficient for daily activities, and only 6.9% admitted to being completely dependent on a third party. The remaining 33.3% of patients claimed that they were partially dependant on others. Most of the patients surveyed described their level of knowledge about the disease as average (51%), 25.5% as high and 18.6% as low.

The average level of stress experienced (PSS-10) in the group was  $5.7 \pm 2.2$ . The results on the PSS-10 scale were as follows: 33.3% of patients achieved a result proving low stress, moderate in 24.5% and high in the rest of the surveyed patients (42.2%).

According to the Beck Depression Inventory, more than a half of the patients (55.9%) did not present any symptoms of depression. However, 27.5% suffered from mild, 10.8% moderate and 5.9% severe depression.

A positive correlation between an increase in stress and depression was noted ( $r = 0.601$ ) – depression was much more frequent among patients experiencing higher levels of stress ( $p = 0.000$ ). No association was found between the level of experienced stress and the patients' age ( $r = 0.082$ ) ( $p > 0.05$ ).

Data analysis showed that, among all the sociodemographic variables considered, patients' financial status had a relevant influence on the experienced level of stress ( $p = 0.001$ ) (Table 1).

Data analysis showed a positive statistically significant correlation between the patients' age and severity of depression ( $r = 0.195$ ,  $p = 0.049$ ). Similarly, a statistically significant correlation exists between duration of renal replacement therapy and the prevalence of depression ( $r = 0.307$ ,  $p = 0.002$ ). The longer the therapy, the greater the prevalence and the severity of depression.

Additionally, a statistically significant link between patients' gender, financial situation and prevalence of depression was established. Women were more likely to suffer from depression than men ( $p = 0.011$ ). People in a more difficult financial situation demonstrated a greater increase in depression ( $p = 0.012$ ). Data analysis showed that pain affected the prevalence of depression. Patients suffering from pain were often and very often more depressed than patients who suffer from pain occasionally ( $p = 0.016$ ). The prevalence of depression was affected by the

Table 1. Differences between the intensity of stress according to sociodemographic and medical factors					
Level of stress					
Variable	Low	Average	High	$\chi^2$	<i>p</i>
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Gender					
Female	11 (32.3)	10 (40.0)	22 (51.2)	2.818	<i>p</i> > 0.05
Male	23 (67.7)	15 (60.0)	21 (48.8)		
Level of education					
Primary	6 (27.3)	6 (27.3)	10 (45.5)	5.886	<i>p</i> > 0.05
Vocational	8 (25.0)	9 (28.1)	15 (46.9)		
Secondary	16 (44.4)	9 (25.0)	11 (30.6)		
Higher	4 (33.3)	1 (8.3)	7 (58.3)		
Employment status					
Retirement	22 (36.7)	16 (26.7)	22 (36.7)	5.553	<i>p</i> > 0.05
Pension	9 (26.5)	8 (23.5)	17 (50.0)		
Employed	3 (60.0)	0 (0.0)	2 (40.0)		
Unemployed	0 (0.0)	1 (33.3)	2 (66.7)		
Financial status					
Very good	5 (62.5)	1 (12.5)	2 (25.0)	23.71	<i>p</i> = 0.001
Good	17 (43.6)	13 (33.3)	9 (23.1)		
Average	12 (26.7)	11 (24.4)	22 (48.9)		
Bad	0 (0.0)	0 (0.0)	10 (100.0)		
Marital status					
Married	24 (36.4)	18 (27.3)	24 (36.4)	6.491	<i>p</i> > 0.05
Cohabitants	2 (66.7)	1 (33.3)	0 (0.0)		
Single	8 (24.2)	6 (18.2)	19 (57.6)		
Prevalence of pain					
Very often	3 (33.3)	0 (0.0)	6 (66.7)	24.929	<i>p</i> = 0.002
Often	5 (19.2)	6 (23.1)	15 (57.7)		
Rare	5 (18.5)	11 (40.7)	11 (40.7)		
Very rare	3 (27.3)	5 (45.5)	3 (27.3)		
None	18 (62.1)	3 (10.3)	8 (27.6)		
Self-sufficiency for daily activities					
Totally dependent	1 (14.3)	0 (0.0)	6 (85.7)	14.172	<i>p</i> = 0.007
Partly dependent	6 (17.7)	9 (26.5)	19 (55.9)		
Self-sufficient	27 (44.3)	16 (26.2)	18 (29.5)		
Level of knowledge about the disease					
Very high	1 (50.0)	0 (0.0)	1 (50.0)	9.868	<i>p</i> > 0.05
High	10 (38.5)	7 (26.9)	9 (34.6)		
Average	20 (38.5)	14 (26.9)	18 (34.6)		
Low	2 (10.5)	4 (21.1)	13 (68.4)		
Very low	1 (33.3)	0 (0.0)	2 (66.7)		

*n* – number of individuals,  $\chi^2$  – chi-square, *p* – probability value.

Table 2. Severity of depression according to sociodemographic and medical factors						
Level of depression						
Variable	None	Mild	Average	Severe	$\chi^2$	<i>p</i>
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Gender						
Female	19 (44.2)	13 (30.02)	6 (14.0)	5 (11.6)	6.894	<i>p</i> = 0.011
Male	38 (64.4)	15 (25.4)	5 (8.5)	1 (1.7)		
Level of education						
Primary	12 (54.6)	4 (18.2)	2 (9.1)	4 (18.2)	13.784	<i>p</i> > 0.05
Vocational	17 (53.1)	11 (34.4)	2 (6.3)	2 (6.3)		
Secondary	23 (63.9)	9 (25.0)	4 (11.1)	0 (0.0)		
Higher	5 (41.7)	4 (33.3)	3 (25.0)	0 (0.0)		

**Table 2. Severity of depression according to sociodemographic and medical factors**

Level of depression						
Variable	None	Mild	Average	Severe	$\chi^2$	<i>p</i>
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)		
Employment status						
Retirement	29 (48.3)	17 (28.3)	10 (16.7)	4 (6.7)	7.097	<i>p</i> > 0.05
Pension	22 (64.7)	9 (26.5)	1 (2.9)	2 (5.9)		
Employed	4 (80.0)	1 (20.0)	0 (0.0)	0 (0.0)		
Unemployed	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)		
Financial status						
Very good	7 (87.5)	1 (12.5)	0 (0.0)	0 (0.0)	21.043	<b><i>p</i> = 0.012</b>
Good	26 (66.7)	9 (23.1)	3 (7.7)	1 (2.6)		
Average	20 (44.4)	17 (37.8)	6 (13.3)	2 (4.4)		
Bad	4 (40.0)	1 (10.0)	2 (20.0)	3 (30.0)		
Marital status						
Married	41 (62.1)	16 (24.2)	6 (9.1)	3 (4.6)	7.173	<i>p</i> > 0.05
Cohabitants	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)		
Single	13 (39.4)	12 (36.4)	5 (15.2)	3 (9.1)		
Prevalence of pain						
Very often	1 (11.1)	5 (55.6)	1 (11.1)	2 (22.2)	24.676	<b><i>p</i> = 0.016</b>
Often	10 (38.5)	7 (26.9)	5 (19.2)	4 (15.4)		
Rare	20 (74.1)	5 (18.5)	2 (7.4)	0 (0.0)		
Very rare	7 (63.6)	3 (27.3)	1 (9.1)	0 (0.0)		
None	19 (65.5)	8 (27.6)	0 (0.0)	0 (0.0)		
Self-sufficiency for daily activities						
Totally dependent	1 (14.3)	2 (28.6)	2 (28.6)	2 (28.5)	29.427	<b><i>p</i> = 0.000</b>
Partly dependant	11 (32.4)	13 (38.2)	8 (23.5)	2 (5.9)		
Self-sufficient	45 (73.8)	13 (21.3)	1 (1.6)	2 (3.3)		
Level of knowledge about the disease						
Very high	1 (50.0)	0 (0.0)	1 (50.0)	0 (0.0)	28.293	<b><i>p</i> = 0.005</b>
High	13 (50.0)	9 (34.6)	4 (15.4)	0 (0.0)		
Average	36 (69.2)	11 (21.2)	4 (7.7)	1 (1.9)		
Low	6 (31.6)	8 (42.1)	1 (5.3)	4 (21.1)		
Very low	1 (33.3)	0 (0.0)	1 (33.3)	1 (33.3)		

*n* – number of individuals,  $\chi^2$  – chi-square, *p* – probability value.

patients' self-sufficiency for daily activities – the issue of depression mainly concerned patients who were dependant upon others for daily activities (*p* = 0.000). It is worth noticing that the level of knowledge about the disease had a significant influence on the prevalence of depression. Patients with low and very low levels of knowledge about the disease were more prone to suffer from depression (*p* = 0.005) (Table 2).

## Discussion

### Key results

This analysis found evidence for the fact that patients differ in terms of experienced stress – 42.2% of patients experienced severe stress, and 25.5% experienced an average level of stress. The rest was characterised by a low intensity of stress. Factors such as gender, age, level of education, employment status, marital status, place of residence, level of knowledge about the disease and duration of renal replacement treatment did not influence the level of stress. This was not confirmed by the studies of Mahdavi et al., which proved that factors such as age, gender, marital status, level of education and duration of renal replacement therapy significantly affected the level of stress experienced by the haemodialyzed patients [13]. Our own study showed that financial status, pain and self-sufficiency

for daily activities increased the level of stress. Mahdavi et al. also proved that financial status had an influence on the level of stress among patients [13]. Studies by Mianowana et al. suggest that 74% of patients experienced stress during their first dialysis, which was related to the new situation. The first dialysis was frequently significantly more stressful for patients living in large cities or in the country – the need to leave work was the main cause of stress [14].

Depression is an increasing problem among haemodialyzed patients, and its consequences may be very serious. Data from literature regarding depression varies significantly. Our study, conducted on a group of 102 haemodialyzed patients, shows that 44.1% of those surveyed suffered from symptoms of depression of varying intensity – the majority (27.5%) presented with mild and moderate (10.8%) depression. Higher scores were achieved in studies by Białobrzaska. The author's analysis showed that 52.8% of patients suffered from depression, 34.7% presented with mild depression, and 19.1% with moderate depression [2]. A study conducted by Książek et al. on a group of 206 haemodialyzed patients showed that even 70% of the respondents suffered from mild or moderate depression [15]. On the other hand, Gerogianni's study, conducted on a group of 414 haemodialyzed patients from 24 dialysis centres in Greece, showed that 29.4% of patients suffered from depressive disorders, 17.1% of whom were characterised as moderately depressed and others as severely depressed [16].

Research by Liu et al. showed that 45.9% of patients treated with haemodialysis experienced depressive symptoms [17]. Fan et al. carried out a study on the influence of depression on mortality rates among haemodialyzed patients, which showed that more severe depression is associated with a greater risk of death among dialyzed patients regardless of the cause of death [18]. As numerous studies have shown, depressive disorders are the most common mental disorder among patients undergoing haemodialysis, especially at the final stage of renal failure. According to literature on the subject, an approximate proportion of prevalence of depression is estimated at 25% in the population of haemodialyzed patients [19]. Similar results are achieved for other chronic diseases. Among patients suffering from type 1 diabetes, the proportion of depressed patients ranged between 11% and 30% [20]. On the other hand, in the study by Duda-Sobczak et al. on a group of patients suffering from the same disease, 42% of patients presented with symptoms of depression [21].

Our study proved a statistically significant relationship between patients' gender and a strong link between depression and financial status. People in difficult financial situations and women were more likely to suffer depression. Gerogiani reached similar conclusions in his study. Additionally, the author quoted achieved similar results regarding the fact that patients with a lower level of education, divorced, widowers and retirees are more prone to suffer from depression. The patients' age is significantly related to the prevalence of depression. Elderly patients presented with higher levels of depression [16]. Our analysis showed a positive correlation between patients' age and level of depression.

Similarly, in results obtained in studies by Liu et al., a relationship between symptoms of depression and the age of patients was shown, with the elderly showing a higher level of depression [17]. No indications of the effect of the level of education, marital state, family situation, employment status or place of residence on depression have been established. The research by Manandhar et al. did not show significant differences between the level of depression and gender, place of residence, education, amount of alcohol consumed and the presence of comorbidities. However, a relationship between the level of depression and employment status was demonstrated [22].

Makara-Studzińska et al. achieved different results in a study on a group of haemodialyzed patients, which proved a link between severity of symptoms and place of residence and employment status. Depression was most common among patients living in the country and pensioners [23].

Negative emotions experienced by haemodialyzed patients, such as fear and anxiety, negatively affect the process of accepting adverse events in their lives. Knowledge and understanding of different processes occurring in a patient's body at different stages of CKD might be helpful in preparing patients to accept renal replacement therapy and improve the doctor-patient relationship [24]. Our analysis proved that people with a higher level of knowledge about their disease were less likely to suffer from depression. On the other hand, Selinger et al. established in their study on 258 patients with inflammatory bowel disease that better understanding of their condition leads to higher levels of anxiety and depression [25].

### Limitations of the study

Our study had certain limitations – it did not include potentially relevant variables (such as co-existing chronic diseases, sleep disorders, lack of data on inflammatory markers, duration of illness), which could significantly influence the level of stress and prevalence of depression [7, 26, 27]. The listed criteria will be taken into account when extending the tests carried out so far.

### Conclusions

Haemodialysis patients were most often characterised by mild depression and high stress levels. In patients with severe pain and low self-reliance, increased stress and increased severity of depression was observed. The longer the therapy, the more severe the depression. Women, the elderly and the sick who were in a difficult financial situation were more susceptible to depression. It is necessary to take preventive measures as early as possible in the form of screening and diagnostic tests for the occurrence of depression, which should be implemented at the beginning of chronic kidney disease.

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