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Changes in the lifestyle among dialysis patients – a descriptive study

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ABSTRACT

Introduction: End-stage renal disease (ESRD) requires dialysis treatment. This treatment changes patients' lives, including limitations on physical activity.

In this study, we highlighted the mobility aspects of patients' lives compared to the control group (non-dialyzed).

Materials and methods: Seventy-nine dialysis patients and 125 controls were studied. The study used an original questionnaire on socioeconomic status, physical activity, and lifestyle. All data were statistically analyzed between dialysis patients and controls divided into female and male groups.

Results: Most of the dialysis patients were obese, and each had concomitant chronic diseases of other organs. Significantly lower levels of employment ($p = 0.001$ for women; $p = 0.005$ for men) and physical activity ($p = 0.047$ for women; $p = 0.001$ for men) were observed in dialysis patients compared with controls. Both groups had high motivation and knowledge about the health benefits of physical activity. However, dialysis patients had significantly more concerns about engaging in physical activity ($p < 0.001$).

Conclusions: Dialysis patients are at risk for the negative consequences of occupational and physical inactivity. Healthcare professionals (physicians and physiotherapists) can take advantage of the high motivation of dialysis patients to overcome the fear of physical activity. Based on the current study and a previous study on the posture of dialysis patients, a universal set of exercises for dialysis patients has been created and is available on the YouTube platform: https://www.youtube.com/watch?v=Ng0sVOViQ-0&feature=youtu.be. The exercises can be done during dialysis and at home.

Keywords: dialysis patients; physical activity; chronic kidney disease; quality of life; lifestyle; hemodialysis.

INTRODUCTION

Chronic kidney disease (CKD) is a multi-symptom disease. During CKD, uremic toxins accumulate in the body and have negative effects on other organs and systems [1, 2, 3], leading to deterioration of overall body function. End-stage renal disease (ESRD) requires dialysis treatment. The need for dialysis treatment dramatically changes the lives of patients. Due to a long list of lifestyle, dietary, and arteriovenous shunt prevention recommendations, patients must adjust their physical and occupational activities to the treatment modality. Dialysis patients must be in constant, regular contact with the dialysis center at strictly defined times. Dependence on in-hospital care and dialysis machines has a strong impact on the daily functioning of the patient: it causes difficulties in normal family life, work, and study, as well as emotional discomfort [1, 2, 3, 4]. Most patients adopt a sedentary lifestyle. A study by Carvalho et al. [5] showed that patients spend 70% of their time lying down during the day. The time spent passively in a sitting or lying position during dialysis (approx. 12 h per week) reduces patients' physical activity [3]. A sedentary lifestyle damages the entire musculoskeletal system: it weakens muscles, reduces the flexibility and strength of tendons and ligaments, limits the range of motion of joints, and impairs coordination and sensorimotor control [6, 7, 8, 9, 10]. Not only does muscle strength decrease, but cardiovascular and respiratory function also deteriorate, and the onset of fatigue after exercise is more rapid [5, 6, 11, 12, 13]. This affects posture, physical and mental performance, and overall functioning and quality of life [6, 7, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21].

The exercise capacity of dialysis patients is determined by their underlying disease and comorbidities, most commonly hypertension and other cardiovascular diseases, diabetes, and obesity. Regular physical activity has many beneficial effects on the cardiovascular system: it increases the ejection fraction of the heart, reduces end-systolic volume, and decreases stiffness and resistance of the peripheral vessels. These changes lower arterial pressure, reduce cardiac workload, and increase blood flow through the subendocardial vessels [14]. Patients on dialysis have a 10–30% higher risk of cardiovascular disease than the general population [18]. The positive impact of physical activity on the health of patients with CKD has been emphasized for years. However, exercise programs or physical rehabilitation are still not commonly

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incorporated into the treatment plans of dialysis patients [7, 9, 12, 16, 22]. In this study, we analyze the impact of CKD and dialysis therapy on physical activity and employment among patients and identify the reasons that motivate patients to engage in such activities.

MATERIALS AND METHODS

The study group consisted of 79 patients undergoing dialysis at the Dialysis Center of the Department of Internal Diseases and Nephrology, Second Independent Clinical Hospital of the Pomeranian Medical University in Szczecin (PMU), Poland. The group consisted of 29 women aged 29–86 years (mean age 65 ±14 SD) and 50 men aged 33–91 years (mean age 67 ±14 SD). Inclusion criteria were: age older than 18 years and treatment duration longer than 3 months.

The control group consisted of 125 individuals. This group consisted of 88 women aged 41–86 years (mean age 62 ±9 SD) and 37 men aged 44–91 years (mean age 67 ±9 SD). Inclusion criteria were age over 18 years and absence of CKD.

There were no statistically significant differences in age between study and control groups for women ($p = 0.158$; t-Student test) and for men ($p = 0.715$; t-Student test), in body mass index (BMI) and education level.

The study protocol was approved by the PMU Bioethics Committee, decision No. KB-0012/161/17 dated December 18, 2017. Participation in the study was voluntary and each patient gave written informed consent. A questionnaire-based survey was conducted in the dialysis and control groups. The questionnaire was designed by the authors of this study and consisted of 22 open and closed questions regarding:

- general information about the patient such as place of residence, education, chronic diseases and BMI,
- physical activity in the past and present time – type of activity, frequency, regularity, reasons for not engaging in physical activity, awareness of the importance of physical activity for health,
- lifestyle – employment, ways of spending leisure time.

Statistical analysis

Descriptive statistics of age were presented as: mean, standard deviation, minimum and maximum values. The normality of age distribution was tested using the Shapiro–Wilk test. Descriptive statistics of qualitative data were presented as counts and percentages. Age differences between groups and sexes were calculated using Student's t-test. Pearson χ^2 test of independence was used for intergroup comparisons of qualitative data. Differences were considered statistically significant at $p < 0.05$. Calculations were performed with Statistica 13.0 software.

RESULTS

There were no statistically significant differences in place of residence, education, or BMI between the sexes within the study groups or between the dialysis patients and the control group. However, in both groups, most participants (male and female) were overweight.

Data on past and present employment are shown in Figure 1. Past employment was defined as employment around the age of 30–40 years or about 20 years before the diagnosis of CKD. Approximately 88–98% of respondents reported working in the past. Significantly more women in the control group were employed in the past compared to those currently on dialysis ($p = 0.011$). A significant difference was observed between non-dialyzed and dialyzed women ($p = 0.001$) and non-dialyzed and dialyzed men ($p = 0.005$) – Figure 1. The disease had a significant impact on patients' occupational activity. Few reported that they continued to work despite dialysis.

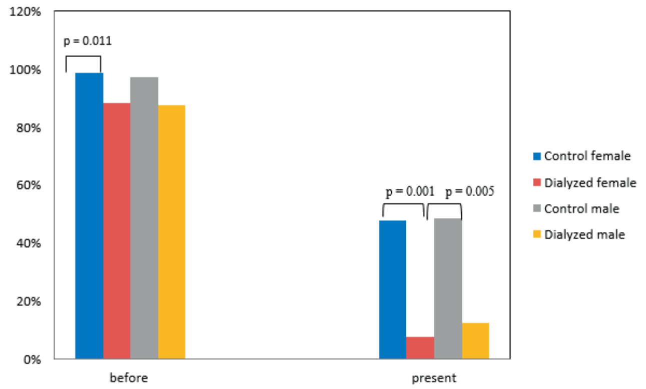

FIGURE 1. Employment of the participants

Analysis of work posture, which has a significant impact on postural disorders, showed no differences in past work posture between non-dialyzed and dialyzed women (Fig. 2). In the group of men on dialysis, significantly more subjects reported standing at work in the past ($p = 0.045$), while non-dialyzed subjects reported standing and sitting at work.

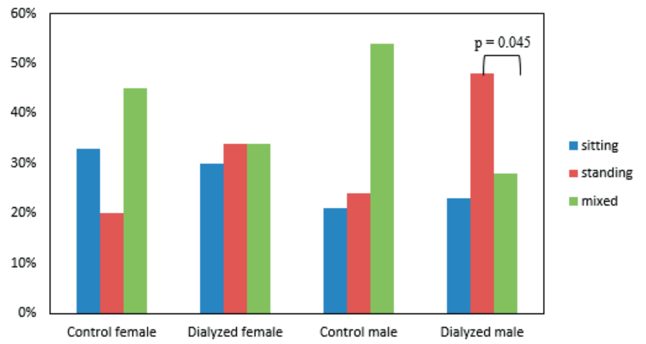

FIGURE 2. Body position during work of the participants before dialysis

Past and present physical activity data are shown in Fig. 3, 4. A significant difference was found in the frequency of physical activity between women on dialysis and women not on dialysis. Women on dialysis were more likely to report physical activity in the past ($p = 0.008$). The current level of physical activity was lower in dialysis patients compared to controls: women ($p = 0.047$) and men ($p = 0.001$).

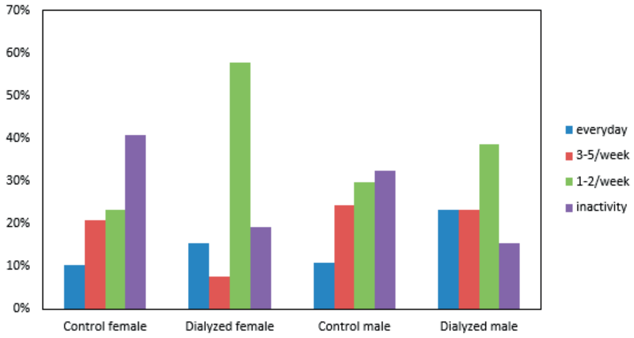

FIGURE 3. Frequency of physical activity in the past

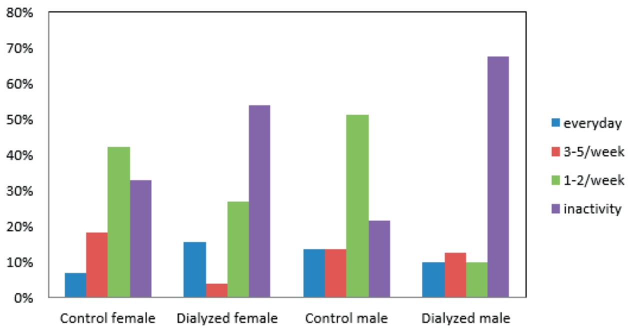

FIGURE 4. Frequency of current physical activity

In all patient groups, walking was the most popular type of activity in the past and present (Fig. 5, 6). At the time of the survey, 81% of dialysis women and 59% of dialysis men preferred short walks (Fig. 6). Dialysis patients were less interested in physical activity.

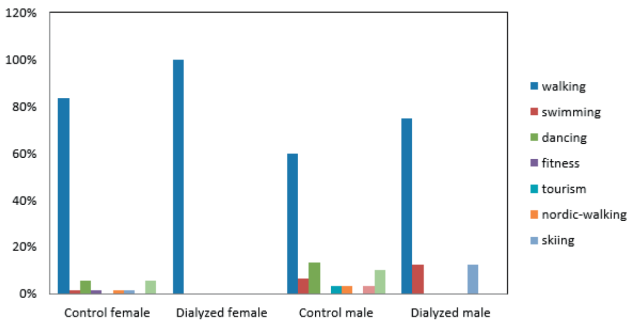

FIGURE 5. Preferred type of physical activity in the past

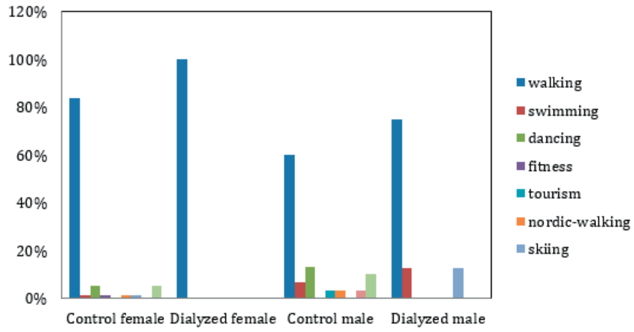

FIGURE 6. Preferred type of current physical activity

The mode of transport used by patients usually has a strong influence on overall physical activity, and this aspect of lifestyle was analyzed in both groups. Dialysis patients were more likely to travel by car and non-dialysis patients were more likely to walk. The differences in mode of travel within the dialysis group ($p = 0.965$) and control group ($p = 0.179$) and between the groups were not significant ($p < 0.05$) – Figure 7.

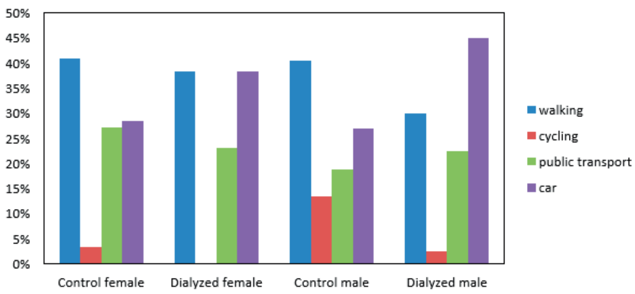

FIGURE 7. Preferred way of movement

In both groups, lack of time was cited as the main reason for not engaging in regular physical activity in the past (Fig. 8). At present, the main reason given by dialysis patients for not engaging in physical activity was health problems. Among controls, lack of time was the most common reason for inactivity for women and health problems for men. Differences in responses within this group were not significant ($p = 0.275$).

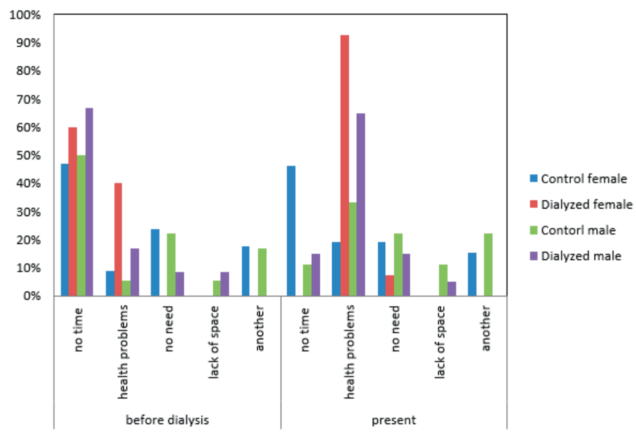

FIGURE 8. Obstacles to physical activity

Significant differences were observed between the control and dialysis groups in the personal reasons for activity (Fig. 9). Health reasons were significantly more common in dialysis patients (82%) than in controls ($p = 0.004$). All respondents valued the role of physical activity. There were significant differences in self-assessed ability to exercise between the control and dialysis groups. Women on dialysis were significantly more likely to believe that they could not be physically active ($p < 0.001$).

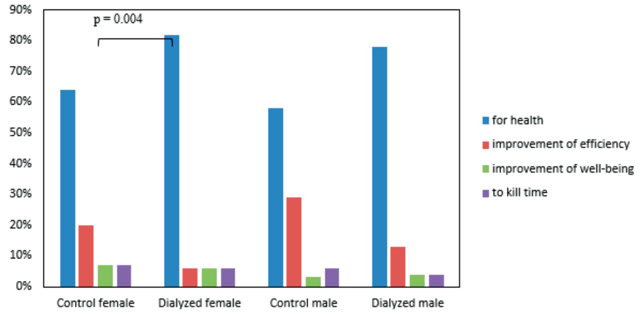

FIGURE 9. Personal reasons for physical activity

In the dialysis group, 94% of women and 87% of men motivated themselves for physical activity (Fig. 10). There were no significant differences in sources of motivation between the dialyzed and non-dialyzed subjects ($p = 0.077$). Self-motivation was the most important reason in both groups.

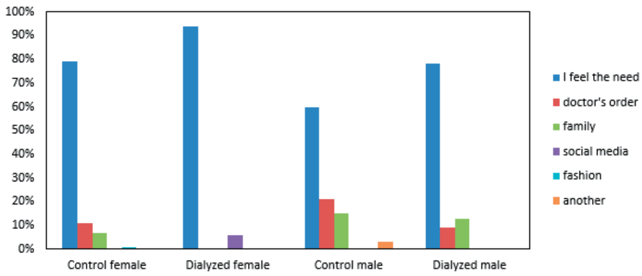

FIGURE 10. Motivators for physical activity

DISCUSSION

Dialysis is often unavoidable, but at the same time it is stressful, inconvenient, and radically changes a patient's daily life. The disease itself is a new and difficult situation for the patient. Therapeutic procedures, travel to dialysis centers and dependence on equipment, medical care, and other people very often have a negative impact on the patient's lifestyle and also give rise to negative emotions: fear, anxiety and anger. Chronic kidney disease also has a negative impact on the quality of life of dialysis patients [4, 14, 23, 24]. Previously, quality of life was measured in terms of material well-being [15]. Today, it is defined by the WHO as an individual's perception of his or her position in life in the context of the culture and value systems in which he or she lives and in relation to his or her goals, expectations, standards, and concerns. A good quality of life means that an individual has a happy and stable personal life, is employed, has a satisfactory economic status, and is able to cope with personal problems [25].

Patients with CKD are very often forced to change their lifestyle: give up work, hobbies or physical activity, change habits, and give up pleasures [1, 7, 12, 13, 14, 18, 19, 26]. Dialysis therapy affects patients' daily lives physically, mentally, and socially [21, 27, 28]. A study by Pikus and Moczydłowska found that 75.7% of dialysis patients were unemployed [29]. In a population of dialysis patients in Tarnów, Poland, only 5% were employed, 43% were retired, and 53% received a disability pension due to illness and the need for dialysis. Wojczyk reported that 40% of patients stopped working altogether, 13% reduced their working hours and 5% changed jobs [21]. A study conducted in Spain by Mauro et al. found that 33% of dialysis patients worked, with twice as many men working as women [30]. A study in Croatia showed an employment rate of 18% [31]. In our study, the employment rate among dialysis patients was 7.5% for women and 12.5% for men. Similar to the study by Mauro et al. [30], there were more working men than women. Compared to the group of working non-dialysis patients, the number of working dialysis patients was 6 times lower in women and 4 times lower in men. We found significant differences in the employment rates of the same people in the past. The employment rate decreased in both the control and dialysis groups, which is associated with natural aging and retirement, but the number of unemployed subjects was significantly higher in the dialysis group. The type of work may also have contributed to such a large decrease in the employment rate. There was a significant decrease in the number of patients who worked. Most of the dialysis patients who were still employed had jobs that required standing and sitting.

Respondents often reported a deterioration in general living conditions related to reduced employment. Dialysis patients reported that they were often forced to quit their jobs, but they also complained of reduced social interaction. In a study by Grochowska et al. [32], this problem was reported by more than 30% of respondents. Similar results were reported by Wojczyk [21].

Chronic kidney disease and long-term dialysis reduce the physical capacity of patients and have a negative impact on their well-being. Patients complain of fatigue, attention problems, sadness, and depression. Grochowska et al. reported that these symptoms were more severe in men [32]. Reduced physical fitness and reluctance to exercise have been observed by most researchers [21, 30, 31, 32, 33]. Patients studied by Pikus and Moczydłowska [29] also reported that CKD had a negative impact on their sexual life.

A decrease in physical activity is observed from the beginning of the disease. Gołębiewski et al. observed impaired muscle function in 50% of the patients studied [14]. Uremic myotonia was first described in 1967 by Serratrice et al. [34]. Uremia causes progressive muscle weakness. Patients complain of easily induced fatigue and myalgia. Changes in the muscular system coexist with dysfunctions of the nervous system, including paresthesias, abnormal vibration perception, abnormal deep tendon reflexes, and muscle weakness. These problems usually result from demyelination of nerve fibers and slower nerve conduction in both motor and sensory fibers. Disturbances in ion regulation, especially elevated potassium levels, induce neurotoxic effects [14].

Patients also report problems with daily routines and reluctance to engage in physical activity [13, 14, 21, 26, 29, 35, 36, 37, 38]. Among 1300 patients treated in a dialysis center in Gdansk [33], only 34.5% of respondents reported regular physical activity. Graham-Brown et al. found that less than 50% of dialysis patients surveyed were physically active at least once a week [35]. In our study, only 25% of women and 10% of men exercised at least once a week, which was significantly less than in the control group. Dialysis patients were significantly more likely to choose a passive way of spending their leisure time, and the frequency of exercise was too low. Gomes et al. observed a lower level of physical activity in dialysis patients, especially on dialysis days, compared to the control group [12]. In our study, the main reasons given by both dialysis and non-dialysis patients for not exercising in the past were lack of time and lack of interest in an activity. Dialysis patients also reported not exercising in the past because of health problems – 40% of women and 20% of men in this group reported this reason, which means that their health status influenced their physical activity even before starting dialysis therapy. At the time of the survey, health problems in the vast majority of dialysis patients and lack of interest in the activity (15–20%), as well as reluctance to exercise (20%) and lack of time (45% of respondents) in the control group were the most common reasons for respondents to avoid physical activity.

In most studies, patients reported that their disease significantly limited their physical activity [13, 14, 35, 36, 37, 38], which is consistent with our findings. The majority of dialysis patients (approx. 65–70%) reported that they were not physically active: they preferred to spend their leisure time passively and were reluctant to engage in physical activity. There was a clear difference compared to the control group, in which 55–70% of respondents reported regular physical activity and a positive attitude toward leisure time activity. A similar proportion (approx. 35–40%) of dialysis and non-dialysis patients reported walking on a daily basis, suggesting that they were getting a minimum daily dose of exercise.

Similar observations were made by Carvalho et al. [5] and Gomes et al. [12], who found that the level of physical activity in dialysis patients was about 30% lower than in non-dialysis patients.

Our study also confirmed a decrease in physical activity over time. There was a significant difference between the level of physical activity in the past and at the time of the survey in the dialysis group, but not in the non-dialysis group.

Most studies have shown that walking is the preferred activity of dialysis patients. In a study by Pikus and Moczydłowska, this type of activity was reported by 86% of respondents. Other popular activities were cycling (14%) and swimming (20%). The above study also analyzed the type of physical activity in relation to the level of education. Respondents with secondary education preferred walking, while those with vocational education opted for walking and cycling [29]. In our study, the majority of dialysis patients had tertiary or secondary education. Walking was also the preferred type of activity in the past and present among the patients in our study (Fig. 5, 6).

A study by Hornik et al. showed that women on dialysis were less active than men [39]. In our study, the proportion of men and women who were inactive was comparable, with slightly more men (56% of women and 67% of men).

Most patients are aware of the need for and benefits of regular physical activity [19, 33]. In our study, more than half of the respondents in both groups believed that physical activity was important for health; 70% of both dialysis and non-dialysis patients stated that physical activity had a major impact on their physical status and that they should be active; 20–30% of dialysis patients engaged in physical activity to improve their well-being. Interestingly, a small number of respondents (3–7%) engaged in physical activity to improve their appearance and lose weight.

Patients on chronic dialysis have multiple comorbidities that significantly affect their exercise capacity. The dialysis patients with CKD analyzed in our study also suffered from cardiovascular disease (hypertension, atherosclerosis, heart failure, arrhythmia, coronary artery disease, atrial fibrillation, post-stroke conditions), diabetes, gout, uremia, and degenerative changes in the joints and spine. The primary disease and comorbidities contribute to a sedentary lifestyle. Meanwhile, physical activity has an invaluable impact on physical and mental health [3, 6, 7, 10, 13, 14, 40, 41, 42, 43, 44, 45]. Daily balanced exercise reduces the risk of cardiac events and has an antidepressant effect [16]. The risk of cardiovascular disease is reduced both directly and indirectly. The direct effect is achieved by increasing vagal tone and decreasing heart rate. This reduces the risk of ventricular arrhythmias. The indirect effect is achieved by improving the insulin dependence of peripheral tissues and reducing cholesterol levels and inflammatory markers, as well as reducing body weight and increasing muscle mass [45].

However, only 15% of the women and 10% of the men analyzed in our study engaged in regular physical activity. Therefore, it seems that awareness of the role of physical activity in the lives of dialysis patients is still insufficient.

Patients often learn about their disease and how to manage it from the Internet, and less often from books. Unfortunately, only a small percentage of patients receive information from healthcare professionals [29]. The National Kidney Foundation – Kidney Disease Outcome Quality Initiative (NFK-K/DOQI) [46] recommends motivating patients to exercise as a key element of therapy [12, 16, 47, 48], but a study by Weber-Nowakowska et al. showed that only 30% of health professionals follow this recommendation in practice [45]. Canadian research presented a very good option to promote physical activity by showing video material during dialysis sessions. A significant increase in physical activity was observed [49]. In our study, most patients took the initiative to exercise (79% of women and 60% of men in the non-dialysis group vs. 94% of women and 87% of men in the dialysis group). Patients understand the need for physical activity, but unfortunately, health professionals' actions in this area are insufficient and have little impact on patients. Strengthening and rehabilitation exercises can be performed not only between dialysis sessions but also during sessions. A study conducted in Japan [7] showed that exercise improves the range of activities of daily living and quality of life [3, 14, 15, 39, 41, 42, 45, 49, 50, 51, 52]. Exercise should be an integral part of therapy for patients on dialysis, preceded by an assessment of the patient's indications and contraindications for exercise and personal preferences for specific types of physical activity [3, 10, 40, 44, 53, 54, 55].

CONCLUSIONS

Dialysis patients are characterized by low levels of physical activity and reduced employment rates, resulting in lower self-esteem. Walking is the preferred type of activity and should be recommended as the first option for center-based dialysis patients. Most patients are aware of the positive effects of exercise on their health. Only a small number of patients receive information and motivation for physical activity from a physician or other healthcare professional. Therefore, educational efforts need to target 2 groups: patients, who need to be informed about why and how to exercise, and healthcare professionals, who need to learn how to promote physical activity in dialysis patients. Based on the current study and a previous study on posture, a universal set of exercises for dialysis patients has been created and is available on the YouTube platform: https://www.youtube.com/watch?v=NgosVOViQ-0&feature=youtu.be. The exercises can be done during dialysis and at home.

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