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ORIGINAL ARTICLE

The impact of kinesiophobia on physical activity levels in hemodialysis patients: a cross-sectional study

El impacto de la kinesiofobia en los niveles de actividad física de los pacientes en hemodiálisis: un estudio transversal

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Abstract

Objectives: *The aim of this study was to evaluate the relationship between kinesiophobia and physical activity levels in patients with end-stage kidney disease (ESKD) undergoing hemodialysis.* **Method:** *This cross-sectional study involved 227 ESKD patients undergoing HD treatment. Patients were assessed using the Tampa Scale of Kinesiophobia (TSK), the International Physical Activity Questionnaire-short form, and Beck Depression and Anxiety scales.* **Results:** *Our findings revealed a significant association between kinesiophobia and low physical activity levels in HD patients (r = 0.384, p < 0.001). Patients with high TSK scores were more likely to have reduced physical activity levels. In addition, age (odds ratio [OR] = –31.3, p < 0.001), dialysis duration (OR = –57.2, p = 0.003), and TSK score (OR = 49.9, p < 0.001) emerged as independent predictors of physical activity levels. Notably, older age and longer dialysis duration were associated.* **Conclusions:** *This study highlights the significant impact of kinesiophobia on physical activity levels in HD patients. More research is needed to figure out how these things work and help doctors decide how to treat ESKD patients so they can be more active.*

Keywords: *Chronic kidney failure. Depression. Hemodialysis. Kinesiophobia. Physical activity.*

Resumen

Objetivo: *El objetivo de este estudio fue evaluar la relación entre la kinesiofobia y los niveles de actividad física en pacientes con enfermedad renal en fase terminal (ERFT) sometidos a hemodiálisis.* **Método:** *Estudio transversal que incluyó 227 pacientes con ERFT en tratamiento con HD. Se evaluó a los pacientes utilizando la Tampa Scale of Kinesiophobia (TSK), el Cuestionario Internacional de Actividad Física (versión corta) y las escalas de depresión y ansiedad de Beck.* **Resultados:** *Los resultados revelaron una asociación significativa entre la kinesiofobia y los bajos niveles de actividad física en los pacientes en HD (r = 0.384; p < 0.001). Los pacientes con puntuaciones elevadas en la TSK tenían más probabilidades de presentar niveles reducidos de actividad física. Además, la edad (OR: –31.3; p < 0.001), la duración de la diálisis (OR: –57.2; p = 0.003) y la puntuación en la TSK (OR: 49.9; p < 0.001) se revelaron como predictores independientes de los niveles de actividad física. En particular, la edad avanzada y la duración de la diálisis mostraron asociación.* **Conclusiones:** *Este estudio pone de manifiesto el impacto significativo de la kinesiofobia en los niveles de actividad física de los pacientes con HD. Se necesitan más investigaciones para aclarar los mecanismos subyacentes y orientar las decisiones terapéuticas destinadas a reducir la inactividad física en los pacientes con ERFT.*

Palabras clave: *Insuficiencia renal crónica. Depresión. Hemodiálisis. Kinesiofobia. Actividad física.*

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Introduction

Patients with end-stage kidney disease (ESKD) are at risk of a number of comorbidities, such as cardiovascular disease, loss of muscle mass, and endothelial dysfunction, which have a negative impact on their physical function and exercise capacity. Kinesiophobia, defined as the fear of movement due to potential pain or harm, can lead to avoidance of physical activity, creating a vicious cycle of immobility. Possible mechanisms linking kinesiophobia and low levels of physical activity include fear of injury, reduced self-efficacy, and avoidance behaviors in people with hemodialysis (HD). Depression and anxiety were also found to be associated with low levels of physical activity in HD patients. This highlights the importance of addressing mental health in this population. The duration of dialysis treatment was associated with a reduction in physical activity, underlining the need for continuous promotion of physical activity throughout the treatment process. Identification of patients with high levels of kinesiophobia may allow for targeted interventions to reduce anxiety and promote physical activity, which may improve the overall well-being of these patients. This research could have an impact on guidelines for the care of ESKD patients by recommending strategies for the management of kinesiophobia in treatment plans. By emphasizing the importance of addressing kinesiophobia and promoting physical activity, this research contributes to enhancing the care and well-being of ESKD patients undergoing HD.

ESKD is a global health problem characterised by high morbidity and mortality. The number of patients with ESKD is increasing due to the rising prevalence of hypertension (HT) and diabetes mellitus (DM) in the ageing population[1]. Patients with ESKD require renal replacement therapies such as dialysis (HD, peritoneal dialysis [PD]) or kidney transplantation to survive. Patients with chronic kidney failure are at risk of multiple morbidities. These include cardiovascular disease, loss of muscle mass, and endothelial dysfunction. These patients also have significantly reduced physical function and exercise capacity. This has a negative impact on activities of daily living and independence[2-4].

Physical activity is defined as any physical movement produced by skeletal muscles that requires energy expenditure[5]. Physical activity has been shown to be essential for maintaining health and preventing disease progression in all populations[6], including patients with ESKD treated with hemodialysis[7]. Even low levels of physical activity are inversely associated with the risk of death in people with kidney disease[8]. Importantly, regular physical activity is beneficial at all stages of kidney disease, improving physical fitness, muscle strength, and health-related quality of life[9]. However, people with HD are less physically active than healthy controls of the same age[10]. Meanwhile, physical inactivity increases with time and disease severity[11]. Long periods of inactivity have been associated with an increased risk of all-cause mortality in HD patients[12,13].

The term "kinesiophobia" was first used by Kori et al. to describe the fear of movement due to low back pain. Kinesiophobia is not only associated with low back pain, but also with many chronic conditions[14-16]. Patients with kinesiophobia tend to avoid physical activity because it may cause pain or harm[17]. This avoidance behaviour can lead to a vicious cycle of immobility[18,19].

Kinesiophobia is associated with adverse outcomes in several conditions, but has not been studied in patients with ESKD. The main aim of this study was to investigate kinesiophobia and physical activity levels in HD patients. We hypothesized that low levels of physical activity in HD patients would be directly related to kinesiophobia.

Method

Study design and population

The study included patients with ESKD who were being followed at the Nephrology Department of Health Sciences University Umraniye Teaching and Research Hospital in Istanbul, Turkey. Patient enrolment started in May 2023 and ended in August 2023. Inclusion criteria included patients with ESKD (estimated glomerular filtration rate = 15-30 mL/min/1.73 m^2), aged 18-90 years, who were able to give and understand informed consent and who had not previously received special instruction or support for physical activity. Uncontrolled HT (blood pressure > 180/110 mmHg), severe anemia (hemoglobin level < 7 mg/dL), active and proliferative diabetic retinopathy, symptomatic coronary artery disease (CAD), or cerebrovascular disease within 3 months before the study; patients with heart failure (New York Heart Association class III and IV), symptomatic or lethal arrhythmias, significant valvular disease, unassisted ambulation due to orthopedic problems, and a history of cerebrovascular or peripheral arterial disease were excluded. Patients with unstable chronic renal failure, including those with acute declines in renal function that were considered reversible, including those who would require renal replacement therapy within 6 months, and those who had an intravenous procedure or PD catheter, were also excluded.

Data collection

Patient data were collected by the research physician, and patients were interviewed using a face-to-face interview technique. A personal information form, the Tampa Scale of Kinesiophobia (TSK), the International Physical Activity Questionnaire-short form (IPAQ-short form), and Beck Depression and Anxiety scales were administered to the patients. The forms took approximately 20-30 min to complete. Clinical, demographic, and personal information about each patient in the study was collected in the individual follow-up forms. Demographic and clinical information included age (years), sex, height (cm), weight (kg), body mass index (BMI) (body weight/height^2 kg/m^2), individual medical history, chronic diseases, and laboratory results.

This study was approved by the Ethics Committee of Umraniye Training and Research Hospital on 25 May 2023 (B.10.1.TKH.4.34.H.GP.0.01/206), performed in accordance with the Declaration of Helsinki, and reported in accordance.

Data tools

TSK

In 2011, Turkish validity and reliability tests of the scale were conducted by Tunca Yılmaz et al.[20] The scale consists of 17 questions. Each question uses Likert scores ranging from 1 to 4, where 1 = “strongly disagree,” 2 = “disagree,” 3 = “agree,” and 4 = “strongly agree.” Total scores range from 17 to 68, with a high score indicating that the individual has a high fear of exercise. Individuals receive a minimum score of 17 and a maximum score of 68, and the higher the score, the greater the fear of movement. A high score on the scale indicates that the person has a high level of kinesiophobia. The TSK was originally designed to measure fear of movement/(re)injury in people with pain. For the current study, minor adaptations were made to the original TSK for use in the population with ESKD. For pain-specific statements, the word ‘pain’ was replaced by “health problems.”

IPAQ

The IPAQ is an internationally validated and reliable questionnaire[21] designed to measure physical activity and sedentary behaviour in adults, with short and long forms. Turkish validity and reliability studies have been conducted and validated[22]. In our study, we administered the short form of the IPAQ to our patients. In the questionnaire, the criterion was that physical activities should be performed for at least 10 min at a time. The IPAQ asks about the duration of walking, sitting for a day, moderate physical activity, and vigorous physical activity in the last week. The total physical activity score (TPSAS) (metabolic equivalent of task [MET]-min/week) is calculated by converting the vigorous, moderate, and walking times into METs corresponding to the basal metabolic rate (1 MET = 3.5 mL/kg/min) using the following calculations:

- Walking score (MET-min/hf) = 3.3 (×) Walking time (×) walking days
- Moderate vigorous activity score (MET-min/hf) = 4.0 (×) Moderate vigorous activity duration (×) moderate vigorous activity days
- Vigorous activity score (MET-min/hf) = 8.0 (×) Duration of vigorous activity (×) days of vigorous activity
- TPSAS = Walking (+) moderate activity (+) vigorous activity score
- Resulting level of physical activity
- Not physically active’ if TFAS <600 METs
- Low level of physical activity’ if TFAS = 600-3000 METs
- TFAS ≥ 3000 METs is defined as ‘adequate physical activity’.

Beck depression scale

It was developed by Beck et al. in 1961. The validity and reliability study of the scale in Turkey was conducted in 1989[23]. The scale assesses depression’s cognitive, emotional, and somatic symptoms. The scale consists of 21 items, each of which contains four self-reported statements. Scale items are scored as 0-3 points. The total depression score is obtained by summing the item scores. A high score on the scale indicates a high level of depression symptoms. According to the scoring system, 0-9 is considered as minimal or none, 10-16 as mildly depressed, 17-29 as moderately depressed, 30 and above as severely depressed[23].

Beck anxiety scale

This measures the frequency of anxiety symptoms experienced by the individual. It is a self-report scale consisting of 21 Likert-type items scored from 0-3. An individual's total score increases with their level of anxiety. It was developed by Beck et al.[24]. A validity and reliability study has been carried out in our country[25]. A score between 0 and 7 on the scale is considered minimal anxiety/normal, between 8 and 15 is considered mild anxiety, between 16 and 25 is considered moderate anxiety, and between 26 and 63 is considered severe anxiety.

Statistical analyses

Data were analyzed using the statistical software the Statistical Package for the Social Sciences version 22 Chicago, IL, USA). Continuous variables were evaluated for the distributional assumption of normality using Shapiro-Wilk test. Continuous variables are expressed as mean ± standard deviation. Student's t-test was used to compare means for continuous variables with normal distribution, while Mann-Whitney U test was used for continuous variables with non-normal distribution. Categorical data were expressed as numbers (percentage), and Pearson's χ^2 or Fisher's exact test was used to analyze categorical variables. In conducting univariate analyses, the following factors were considered: age, gender, BMI, dialysis period, DM, HT, CAD, congestive heart failure (CHF), depression score, anxiety score, TSK score, alkaline phosphatase (ALP), and Ktv/urea reduction ratio. Linear regression analysis was performed to identify independent predictors of MET value using these factors. A receiver operating characteristic (ROC) analysis was carried out to determine the TSK score that was the best indicator of MET status (MET $\geq$ 600). A significance level of < 0.05 was accepted on the basis of the p value.

Results

This cross-sectional study involved 227 patients were included in the study, 152 (67%) were male, and 75 (33%) were female. The mean age of the patients was 59.5 ± 15.8 years. The median duration of dialysis was 4.0 (1.0-8.0, interquartile range) years. The mean BMI of the patient group was 25.6 ± 5.5. General demographics of the study population are shown in table 1.

Table 1. General demographics of the study population

Variables	Hemodialysis patients (n = 227) (%)
Age, years	59.5 ± 15.4
Sex (female)	75 (33.0)
Dialysis duration, years	6.4 ± 6.8
BMI	25.6 ± 5.5
DM, n (%)	67 (29.5)
HT, n (%)	111 (48.9)
CHF, n (%)	20 (8.8)
HL, n (%)	38 (16.8)
CAD, n (%)	18 (7.9)
Hypothyroidism, n (%)	4 (1.8)
MET score	297.0 (0.0-1176.8)
TSK score	38.3 ± 9.3
Beck depression scale score	10.0 (5.0-16.3)
Beck Anxiety Scale score	8.5 (3.0-16.3)

Mean ± standard deviation, numbers and percentage, median and IQR. BMI: body mass index; DM: diabetes mellitus; HT: hypertension; CHF: congestive heart failure; HL: hyperlipidemia; CAD: coronary heart disease; MET: metabolic equivalent; TSK: tampa scale of kinesiophobia; IQR: interquartile range.

A comorbidity analysis of the study population showed that the individuals had a prevalence of several medical conditions. More specifically, 48.9% of the patients had HT, while 29.5% of the patients had been diagnosed with DM. 8.8% of the cases had CHF, 16.8% had hyperlipidemia, and 7.9% had CAD. We found hypothyroidism as a comorbidity in 1.8% of the study population. The physical activity level of the study group was 931.1 ± 1.903 MET. The TSK was 38.3 ± 9.3, the depression score was 11.6 ± 9.6, and the anxiety score was 11.3 ± 10.8.

The study population is divided into two groups according to the physical activity score in table 2. Thus, while age and dialysis duration were significantly lower in Group 1, TSK score and MET level were higher in Group 2.

The laboratory parameters of the patients are shown in table 3. According to table 3, it was determined that the ALP levels of the subjects with low physical activity levels were higher than those of the other group (p = 0.014).

Table 2. Comparison of study groups based on physical activity scores

Variables	Group 1 (MET < 600) (n = 145) (%)	Group 2 (MET ≥ 600) (n = 82) (%)	p
Age (years)	62.8 ± 13.7	53.8 ± 16.7	< 0.001[b]
BMI	25.7 ± 5.5	25.5 ± 5.5	0.885[b]
Gender (female)	50 (66.7)	25 (33.3)	0.539[a]
DM, n (%)	49 (33.8)	18 (22.0)	0.070[a]
HT, n (%)	70 (48.3)	41 (50.0)	0.803[a]
CHF, n (%)	16 (11.0)	4 (4.9)	0.116[a]
HL, n (%)	21 (14.4)	23 (28.0)	0.190[a]
CAD, n (%)	12 (8.3)	6 (7.3)	0.797[a]
Hypothyroidism, n (%)	2 (1.4)	2 (2.4)	0.560[a]
Dialysis duration (years)	5.0 (1.0-10.8)	3.0 (1.0-7.0)	0.035[c]
TSK score	37.0 (31.0-43.8)	42.0 (40.0-46.0)	< 0.001[c]
Beck depression scale score	10.0 (6.0-17.0)	8.0 (4.0-13.0)	0.035[c]

Mean ± standard deviation, numbers and percentage, median and IQR.
[a]χ^2 test.
[b]Student t test.
[c]Mann Whitney U test p < 0.05.
BMI: body mass index; DM: diabetes mellitus; HT: hypertension; CHF: congestive heart failure; HL: hyperlipidemia; CAD: coronary heart disease; TSK: tampa scale of kinesiophobia; MET: metabolic equivalent of task; IQR: interquartile range.

Table 3. Laboratory parameters of study participants

Variables	Physical activity score low (MET < 600) (n = 145)	Physical activity score normal-high (MET ≥ 600) (n = 82)	p
CRP, mg/dL	29.6 ± 27.8	63.1 ± 211.7	0.490[a]
LDH, U/L	201.3 ± 76.5	230.2 ± 99.4	0.402[a]
Phosphorus, mg/dL	5.1 ± 1.8	5.1 ± 1.4	0.821[a]
Albumin, g/dL	3.9 ± 0.4	4.0 ± 0.5	0.088[a]
HDL, mg/dL	39.9 ± 12.4	39.9 ± 12.1	0.991[a]
Triglyceride, mg/dL	166.1 ± 115.3	166.4 ± 75.8	0.987[a]
AST, U/L	14.5 ± 9.6	14.5 ± 16.1	0.995[a]
ALT, U/L	13.4 ± 8.5	12.5 ± 7.1	0.896[a]
PTH, pg/mL	315.0 (201.0-455.0)	268.0 (137.0-586.3)	0.347[b]
Calcium, mg/dL	8.5 (8.0-9.1)	8.6 (8.1-9.1)	0.833[b]
LDL, mg/dL	77.4 (60.0-103.0)	88.5 (68.3-123.3)	0.384[b]
Alkaline phosphatase, U/L	109.0 (79.0-166.0)	79.0 (64.0-156.8)	0.014[b]
KTV/URR	0.02 (0.02-1.77)	0.02 (0.02-1.87)	0.100[b]

Mean ± standard deviation, numbers and percentage, median and IQR.
[a]Student t test.
[b]Mann Whitney U test, p < 0.05.
CRP: the C-reactive protein; LDH: lactate dehydrogenase; PTH: parathyroid hormone; HDL: high-density lipoprotein; LDL: low-density lipoprotein; AST: aspartate aminotransferase; ALT: alanine aminotransferase; KTV/URR: dialysis efficiency/urea reduction ratio; MET: metabolic equivalent of task; IQR: interquartile range.

In the univariate and linear multiple regression analysis performed to find independent variables affecting MET, age ($p < 0.001$), dialysis duration ($p = 0.003$), and TSK score levels ($p < 0.001$) were found to be independent predictors (Table 4).

In the ROC analysis performed to find the TSK score value that best shows MET ≥ 600, it was determined that TSK score > 39 was the best value showing this value with 76.8% sensitivity and 62.5% specificity (Fig. 1).

Discussion

The main purpose of this study was to investigate the relationship between kinesiophobia and physical activity levels in HD patients and to find the factors that may cause low physical activity levels and kinesiophobia. As a result of our study, we showed that kinesiophobia is significantly associated with low physical activity levels in HD patients.

Various patient populations, including those with cardiovascular, musculoskeletal, rheumatological, and pulmonary diseases, have studied the relationship between kinesiophobia and physical activity levels[26-28]. Our study is the first to assess the impact of kinesiophobia on low physical activity levels in HD patients. Evidence from studies of other medical conditions suggests that high levels of kinesiophobia are moderately associated with low levels of physical activity, especially when self-reported physical activity scales are used. It has been suggested that this association may be the result of automatic processes that are self-reinforcing and should not be overlooked. However, there is a lot of variation between studies, and there is not enough evidence from objective measures of physical activity to say for sure that this is a link. The results show that kinesiophobic patients have only a moderate risk of not being more physically active than other patients. Therefore, more evidence is needed to determine the impact of kinesiophobia on therapeutic decisions when aiming to reduce physical inactivity. To confirm these findings and to

Table 4. Factors affecting MET levels in study participants: univariate and multiple regression analysis

Variables	Univariate analysis		Multivariate analysis		
	β	p*	Beta	OR (95% CI)	p**
Age	–39.4	0.008	–31.3	–47.4 to –15.1	< 0.001
Sex (female)	–661.9	0.013			
BMI	–9.6	0.688			
Dialysis duration	–55.2	0.003	–57.2	–94.5 to –19.9	0.003
DM	–514.6	0.063			
HT	–305.4	0.228			
CAD	–195.9	0.676			
CHF	–589.4	0.187			
Beck depression scale score	–22.2	0.107			
Beck anxiety scale score	–10.4	0.384			
TSK	70.7	< 0.001	49.9	23.9-75.9	< 0.001
ALP	–0.866	0.412			
KTV/URR	41.2	0.754			

*Pearson's or Spearman's correlation tests.
**Multiple linear regression analysis.
ALP: alkaline phosphatase; BMI: body mass index; DM: diabetes mellitus;
HT: hypertension; CHF: congestive heart failure; CAD: coronary heart disease;
TSK: tampa scale of kinesiophobia; KTV/URR: dialysis efficiency/urea reduction ratio;
MET: metabolic equivalent of task; OR: odds ratio; CI: confidence interval.

understand the factors and mechanisms that influence the potential relationship between kinesiophobia and physical activity, further studies using instrumented physical activity measures are needed[26-28].

The possible mechanisms underlying the relationship between kinesiophobia and physical activity levels in dialysis patients are not fully understood. However, some of the possible mechanisms are fear of injury, decreased self-efficacy, and avoidance behaviors. Kinesiophobia is an excessive and irrational fear of movement that can lead patients to avoid activities that may cause injury or re-injury[29]. This fear can prevent patients from participating in physical activity, resulting in lower levels of physical activity[30]. Patients with high levels of kinesiophobia may lack confidence in performing physical activities safely and effectively, which can lead to lower levels of physical activity[31]. Kinesiophobia is associated with the promotion of avoidance behaviors, which may contribute to reduced participation in physical activity[29]. These findings suggest that kinesiophobia may negatively affect

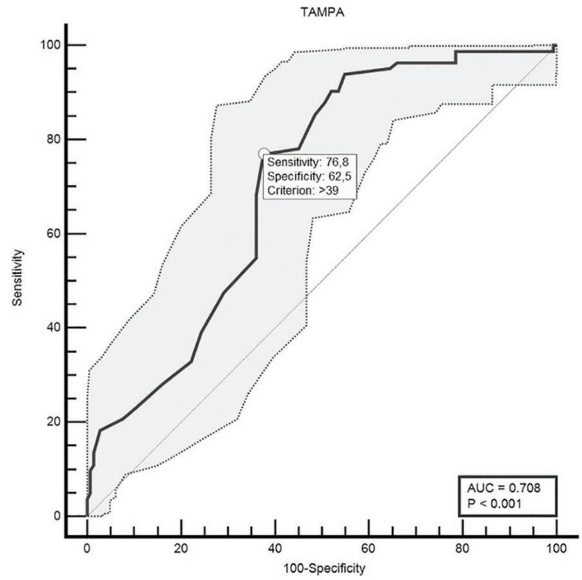

Figure 1. *Receiver operating characteristic analysis for TAMPA value as a predictor of metabolic equivalent of task ≥ 60.*

patients' ability to engage in physical activity, which may indirectly affect their overall physical activity levels. The use of device-based physical activity measures may help to clarify the relationship between kinesiophobia and physical activity levels[30].

Physical activity is generally considered safe for dialysis patients. There are no significant risks associated with it. Indeed, regular physical activity is associated with better outcomes for dialysis patients, including lower mortality and better cardiovascular health[30-32]. However, there are some potential risks associated with physical activity in dialysis patients, such as injury, hypotension, and muscle cramps[33]. Patients with comorbidities such as cardiovascular disease, diabetes, or peripheral vascular disease may be at a higher risk of complications during physical activity and should be monitored closely[33]. In addition, patients with a history of falls or balance problems may be at higher risk of falls during physical activity and should have appropriate precautions in place[33]. In general, the benefits of physical activity in dialysis patients outweigh the potential risks. Healthcare providers should encourage patients to participate in regular physical activity as part of their treatment plan.

In our study, we found that levels of physical activity decreased with age. There have been studies that have investigated the relationship between aging and the level of physical activity in dialysis patients. The study by Lucas et al. investigated physical endurance in older adults receiving HD and examined the utility of accelerometer-derived step frequency variability as a potential measure of physical endurance in this population[34]. Another review by Nitta et al. discussed the management of physical function in elderly dialysis patients and focused on preventing and improving frailty and disability in this population[35]. Furthermore, Johansen et al. looked at how active HD patients were compared to healthy, sedentary controls. They found that hemodialysis patients were less active than healthy, sedentary controls, and the difference was bigger in older people[10]. A review by Zhang et al. summarized the role of physical activity in HD patients and highlighted the association between increased physical activity and reduced mortality in this population[32]. Finally, the study by Myers et al. evaluated the effect of a home-based exercise program on physical function and quality of life indices in HD patients in the elderly care setting[36]. These studies highlight an important area of research with implications for the management of frailty, disability, and mortality in dialysis patients, particularly older adults.

In our study, there was an association between depression and anxiety and low levels of physical activity in people with HD. There have been many studies that have investigated the relationship between depression, anxiety, and physical activity in people with HD. Evidence suggests that depression and anxiety may significantly affect physical activity in this population. For example, a preliminary study found that patients with ESKD who exercised regularly and did not miss too many exercise sessions had a reduction in depression, although there was no improvement in anxiety with exercise[37]. Another study found that HD patients had more comorbidities and higher levels of anxiety and fatigue. Exercise reduced these symptoms[38]. In addition, a cross-sectional study found that physical function and depressive symptoms were independently associated with daily physical activity in ambulatory HD patients. This suggests that depression may contribute to reduced physical activity in this population[39]. In addition, a study of the effect of virtual reality exercises on anxiety and depression in HD patients showed that symptoms of anxiety and depression can be reduced by incorporating regular exercise[40]. Finally, a study investigating the effect of exercising during dialysis on depression in prevalent hemodialysis patients found that exercising during dialysis can improve depression and physical performance in this population[41]. These findings highlight the importance of addressing depression and anxiety in dialysis patients to promote physical activity and improve their overall well-being.

Limitations

One of the main limitations of our study is the small number of patients it included. Another limitation is that there is no long-term follow-up of the patients, and therefore, the long-term effects of the variables cannot be evaluated.

Conclusions

In our study, we found that the duration of being on dialysis treatment was associated with low physical activity. There is limited information on the effects of long-term dialysis treatment on physical activity. However, it is important for dialysis patients to remain physically active. Exercise has many benefits, including improved physical function, muscle mass, and strength.

Physical activity is associated with better outcomes in HD patients, including improvements in physical fitness, muscle strength, and reduced risk of death[33,42]. This topic needs more research to fully understand the mechanisms behind the link between kinesiophobia and the amount of physical activity in HD patients and to find out how kinesiophobia affects treatment decisions to increase physical activity.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments on humans or animals were performed for this research.

Confidentiality, informed consent, and ethical approval. This study does not involve personal patient data, medical records, or biological samples, and does not require ethical approval. SAGER guidelines do not apply.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing or creation of the content of this manuscript.

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