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THE IMPACT OF EXERCISE ON QUALITY OF LIFE IN DIALYSIS PATIENTS

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ABSTRACT

Background. The global prevalence of kidney failure is increasing, impacting millions. Dialysis patients face unique challenges, leading to a significant decline in their quality of life. Common issues such as sleep disturbances, anxiety, depression, and chronic fatigue are prevalent in this population. While exercise is known to improve physical function of this group of patients, this review specifically explores the impact of sport and physical activity on the quality of life of dialysis patients.
Aim. The aim of this review was to show the existing associations between exercise and quality of life in dialysed patients.
Material and methods. To gather all currently recognized information on the topic, we performed a search of the literature, including studies up to June 2025. We used PubMed, Cochrane Library, Web of Science and Embase databases. We assessed the information included in articles published in English and Polish. We used a combination of keywords related to exercise, quality of life, dialysis, chronic kidney disease, sleep, depression, anxiety and chronic fatigue. We searched for relevant articles and chose the applicable ones to accomplish the objective of our review.
Results. Exercise demonstrably benefits the maintenance and enhancement of quality of life in dialysis patients. By alleviating symptoms of depression and anxiety, sleep disorders, chronic fatigue, and Restless Legs Syndrome (RLS), physical activity positively impacts patients' overall well-being.
Conclusions. Our study definitively shows exercise training effectively alleviates a range of debilitating symptoms in hemodialysis patients. This underscores the critical need to integrate tailored exercise interventions to significantly improve the overall health-related quality of life for this vulnerable population.

KEYWORDS

Quality of Life, Dialysis, CKD, Exercise, Sport, Sleep, Depression, Anxiety, RLS, Chronic Fatigue

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1. Introduction

The prevalence of kidney failure is increasing worldwide and is currently estimated to be between 4.9 and 7.0 million people. [1] Dialysis patients are a unique group of patients whose needs require an exceptionally comprehensive approach.

Dialysis patients face numerous challenges: loneliness, feelings of helplessness, a sense of dependence, and the necessity of conforming to the rhythm of dialysis. Their quality of life declines, and maintaining or improving it becomes a significant challenge. Problems frequently encountered by dialysis patients include sleep disturbances, anxiety and depressive disorders, and chronic fatigue.[2] While advancements in dialysis techniques have recently extended the survival of patients with End-Stage Renal Disease (ESRD), this population continues to experience a substantial array of complications and a significant symptom burden, stemming from either the underlying ESRD itself or the hemodialysis (HD) treatment.[3]

Individuals on maintenance dialysis are frequently affected by mental complications that significantly reduce their health-related quality of life. [4]

Consequently, the prevalence of psychiatric disorders in patients on dialysis is higher than in the general population. [5] Symptoms of anxiety and depression occur in 50% of patients receiving renal replacement therapy using HD, and the frequency of their occurrence is higher than in other chronic diseases.

Sleep disorders are prevalent in patients with chronic kidney disease (CKD) in particular those with ESRD. It has been reported that 80% of ESRD patients receiving dialysis report sleep complaints, with daytime sleepiness to be the most common reported symptom. [6][7]

Contemporary medical management of HD patients is heavily reliant on pharmacological interventions. However, the high cost and associated adverse effects of conventional pharmaceuticals present significant challenges. Healthcare professionals must therefore recognize that individuals with ESRD typically manage

complex polypharmacy regimens, and their compromised renal function predisposes them to an elevated risk of adverse drug reactions, drug-drug interactions, and other medication-related complications. Consequently, there is an imperative for healthcare providers to identify efficacious and well-tolerated treatments that can alleviate the symptom burden in HD patients, thereby contributing to the preservation of their quality of life and overall well-being.[8]

Exercise (both aerobic and resistance) improves objective measures of physical function in individuals on hemodialysis. [9] The literature describes many of the benefits of practicing and increasing regular physical activity for the health and well-being of patients with chronic kidney disease.[10] Despite this fact, in this group of patients there is still significantly lower level of physical activity compared to persons with normal kidney function.[11][12]

In this review, special attention was paid to impact of sport and physical exercise on the quality of life of the dialysed patients.

2.1. Quality of life (QoL)

Quality of life (QOL) is conceptualized as an individual's subjective appraisal of their life circumstances, interpreted within their specific cultural context and in reference to their personal objectives, aspirations, benchmarks, and preoccupations [13], and it is a widely accepted idea in medicine and health. QoL serves as a valuable prognostic tool for predicting the efficacy of treatments and interventions. Furthermore, it functions as a qualitative health indicator that extends beyond conventional biomedical outcomes like disease remission or survival rates. [14].

2.2. Influence of Sleep on QoL in general population and in HD patients

A robust association exists between sleep and QoL across diverse populations, including individuals with various physical and psychiatric conditions, those with sleep disorders, and the general populace spanning all age groups. Both quantitative (e.g., duration) and qualitative (e.g., perceived quality) dimensions of subjective sleep evaluation have been demonstrated to impact QoL. Numerous cross-sectional investigations have linked short sleep duration to diminished QoL in the general population. Concurrently, a substantial body of cross-sectional research has indicated that poor sleep quality is similarly correlated with lower QoL. These findings are further supported by a recent longitudinal study, which observed that improvements in both sleep duration and sleep quality were associated with enhanced QoL. [15]. Sleep disorders, defined by abnormal sleep patterns or behaviors, are highly prevalent among patients with ESRD. Specifically, this patient population frequently experiences sleep apnea, restless legs syndrome, and generalized poor sleep quality. Chronic disease inherently compromises QoL. Research focusing on the impact of sleep disorders in HD patients has consistently demonstrated their substantial contribution to diminished QoL. Furthermore, several studies have established a direct correlation between poor sleep quality and increased mortality. Beyond sleep, ESRD itself is recognized for its detrimental effects on energy and vitality, often leading to reduced social engagement and negative impacts on mental health. It's critical to note that both suboptimal sleep and depression in HD patients are independently associated with both reduced QoL and an elevated risk of mortality. [16]

Insomnia, defined as trouble falling asleep or sustaining sleep throughout the night, is a common public health concern across a number of age groups across the world. [17] Insomnia is highly comorbid with several physical and mental diseases, demonstrating a bidirectional link wherein each condition can affect the other. [18]. Insomnia in older persons can elevate the risk of falls and exacerbate neuropsychiatric illnesses, including depression and dementia, as well as chronic conditions such as cardiovascular disease, diabetes, and obesity, thereby diminishing overall quality of life. [19].

2.3. Impact of exercise on sleep and QoL in general population and in HD patients.

Attaining at least 150 minutes of moderate-intensity physical activity, distributed across five days per week, represents a significant public health objective. This recommendation originates from the World Health Organization (WHO, 2020) and has been widely integrated into global healthcare systems.[20] A particular trial indicates that, for individuals who are otherwise inactive but meet diagnostic criteria for insomnia, engaging in this recommended level of physical activity significantly lessens the severity of their insomnia symptoms and considerably improves their mood. Furthermore, internationally endorsed minimum levels of physical activity have been shown to alleviate both daytime and nighttime symptoms of chronic insomnia, irrespective of an individual's daily light exposure. [21]

HD patients frequently experience sleep disorders, largely attributed to the considerable stress associated with their underlying disease and the demands of their therapeutic regimen. Studies indicate that insomnia is a predominant sleep disturbance in this population, often manifesting as difficulty with sleep initiation, the inability to maintain sleep (characterized by awakenings), and restless sleep. Furthermore, the necessity of adhering to a rigorous treatment schedule, such as dialysis, imposes a substantial emotional burden on patients, severely disrupting their sleep and leading to difficulties with both sleep onset and maintenance, including premature awakenings. [22]

In this patient population, limitations in physical activity performance exacerbate existing anxiety, intensifying both their physical and mental burden by detrimentally impacting sleep quality. [23] Notably, dialysis dependency has been linked to poor sleep quality, and hemodialysis (HD) patients with sleep-disordered breathing exhibit poorer sleep quality compared to non-HD individuals. [24], [25] Conversely, for patients with sleep disorders, engaging in exercise may decrease the apnea-hypopnea index, enhance sleep quality through daily physical activity, and potentially play a protective role in disease progression. [26], [27]

3.1. Impact of chronic fatigue on QoL in HD patients

Fatigue is a subjective and persistent sensation of physical and/or emotional exhaustion, weakness, and low energy that interferes with daily tasks and activities and may interfere with normal functioning. A state of total tiredness unconnected to activity or exertion is called fatigue.[28]

Even though fatigue is the most commonly reported symptom of kidney disease (KD), it is currently only included as a secondary outcome measure in research. Self-reported fatigue is a common and severely demanding illness among KD patients, although it is not widely recognized or understood. Regardless matter how complicated the mechanisms are, exercise and physical activity treatments can alter a variety of fatigue-related metrics. The purpose of this review is to examine the most recent research on the efficacy of exercise to reduce weariness in KD patients. Although the benefits of exercise for KD are well understood, there is a scarcity of recent clinical trial evidence on weariness.[29]

Fatigue following HD has been associated to poor quality of life, cognitive deficits, unpleasant emotions, and sleep disruptions. [30] It has been proposed that pharmacological treatments, such as vitamin C and L-carnitine, can reduce fatigue in HD patients with end-stage renal disease. [31], [32] Patients turn to nonpharmacological approaches such as exercise to relieve posthemodialysis fatigue because the evidence for this and other pharmacological therapy is ambiguous. [33]

3.2. Impact of exercise on chronic fatigue in HD patients

Nearly 45% of HD patients indicate chronic fatigue as a primary source of stress.[34] A complicating factor in their situation is the present absence of specific medications for this symptom, necessitating the exploration of alternative approaches to mitigate the discomfort. [35] Both conducted systematic review and more recently published meta-analysis provide evidence that exercise training is a effective way of reducing fatigue of patients treated with HD. [36] Fatigue was assessed using the Visual Analogue Scale (VAS), the Rhoten Fatigue Scale and the fatigue dimension of the Profile of Mood States (POMS).[37]

Intradialytic core stabilization and aerobic exercises are well-tolerated by hemodialysis patients. Over an eight-week period, these exercises effectively enhance physical performance, reduce fatigue levels, and improve quality of life in this population (as evidenced by improvements in select parameters of the Kidney Disease Quality of Life-36 - KDQOL-36). Consequently, incorporating intradialytic core stabilization and aerobic exercises into the rehabilitation protocols for hemodialysis patients is recommended. Significant improvements in physical performance and fatigue levels were observed following such training.[38] In some previous studies a simplified yoga-based exercise (twice a week) program has demonstrated its effectiveness as a complementary, safe, and efficacious clinical intervention for ameliorating fatigue, sleep disturbance, and pain in patients undergoing HD.[39]

4.1. Impact of depression on sleep and QoL in HD patients

The study findings on the correlation between persistent sleeplessness and anxiety and depression are inconclusive. Certain research have demonstrated that anxiety and depression are risk factors for chronic insomnia, whilst other studies suggest that anxiety and depression may be subsequent manifestations of chronic insomnia. Recent investigations have demonstrated that the two are bidirectional.[40][41] It was proven that higher depression/anxiety levels correlate with worse insomnia and impacts QoL.[42]

Numerous possible advantages of exercise have been established in a substantial body of literature published in the last 30 years, including positive psychological adaptations (such as an increased subjective QoL). Therefore, there is ample evidence that exercise training can mitigate the effects of ESRD to at least a considerable extent.[43]

4.2. Impact of exercise on depression in HD patients

Regular exercise helps alleviate anxiety and sadness in those undergoing haemodialysis by elevating serotonin, norepinephrine, and dopamine levels, so prompting the brain to generate endorphins that induce feelings of enjoyment and relaxation.[44]

Anxiety and depression in patients receiving haemodialysis can be minimized through various forms of treatment, including pharmacological interventions as well as numerous non-pharmacological approaches, such as regular physical activity, cognitive-behavioral therapy, and relaxation techniques like Benson's relaxation method and acupressure therapy.[45] In patients undergoing hemodialysis, physical exercise leads to improved self-care ability and sleep quality, as well as decrease fatigue, low level of depression and increased quality of life.[46]

Incorporating structured physical exercise as an adjunct therapy within the psychiatric hospitalization of teenagers has resulted in a decrease in depressed symptoms, hence illustrating its efficacy in the treatment of adolescent inpatients with depression. The exercise intervention significantly decreased depressive symptoms after 6 weeks compared to a control social relaxing program. Exercising proves to be an effective additional intervention to antidepressants, therefore it is vital for adolescents experiencing depression, who are at chronicity of their mental disease aggravated by sedentary lifestyle.[47]

Research indicates that exercise has varying effects on self-reported depression among HD patients. A 1-year intradialytic aerobic and resistance exercise program in 44 HD patients in Greece showed a substantial decrease in depressive symptoms evaluated by the Beck depressive Inventory (BDI) compared to usual care controls (-7.68 vs -0.02; $P < 0.001$). [48]

Likewise, another scientific research revealed a substantial decrease in self-reported symptoms of depression (39%) as in comparison to usual care controls in a sample of 33 haemodialyzed patients who underwent a 10-month intradialytic exercise rehabilitation program, consisting of intradialytic cycling and resistance exercise thrice weekly.[49]

In one study, older people demonstrated the largest increase in mood and the lowest level of anxiety. According to these data, younger HD patients were less motivated to participate in physical activity and expressed less interest in exercise classes. Despite their deteriorating condition, older patients voluntarily attended training sessions. [50]

Furthermore, studies have shown that regular exercise is one of the most effective approaches to treat depression in older persons. [51] This is why it is now seen as a potential alternative to antidepressants in this category. Although antidepressants have a quicker onset of therapeutic action, physical activity also boosts physical function. [52]

5.1. Impact of anxiety on sleep and QoL in HD patients Anxiety is one of the most prevalent mental health issues among HD patients with end-stage renal disease. Although the precise frequency of anxiety problems in HD patients is unknown, estimates from different research have varied from about 12% to 52%. The symptoms of depression and anxiety both considerably lower the patients' quality of life, raise the mortality rate, and lead to issues in their social, familial, and professional lives. [53]

The association between anxiety disorders and sleep quality is well-established. Sleep disturbance is a sign of generalized anxiety disorder (GAD). Many patients with GAD report that their daily activities and functions are impaired because of their sleep problems. Many studies have indicated that approximately 47.7% to 74% patients with GAD have some sleep disturbances such as impaired sleep initiation and maintenance. [54]

According to some research, in general population, persons with GAD may be more susceptible to sleep issues if they have negative impact and emotions like worry and anxiety. Due to the prevalence of sleep disruptions in patients with anxiety disorders, the current transdiagnostic methods are therefore more focused on negative affect, such as anxiety, stress, and depression.[55]

In another study HD patients who fit the criteria for an anxiety disorder reported feeling less satisfied with their quality of life as determined by the Kidney Disease Short-form quality of life in comparison to people without anxiety disorders. [56] Scientific literature also highlight the value of utilizing the HADS (Hospital Anxiety and Depression Scale) to detect anxiety and depression and validate the necessity of considering these conditions to improve patients' quality of life and international care.[57]

5.2. Impact of exercise on anxiety in HD patients

One off the prominent research showed that an intradialytic aerobic and resistance exercise program significantly reduced anxiety symptoms as assessed by HADS over the course of a year (2.65 versus 0.05; $P < 0.001$).[48]

Yet another study proved that patients enrolled in the chronic HD program may have less episodes of anxiety and depression symptoms if they regularly engage in virtual reality workouts. Encouragement of patients to engage in virtual reality physical activity is essential since it may improve their mental health. [58]

Patients with ESRD who engage in physical training during dialysis report feeling less depressed and anxious. Although both resistance and endurance exercise elevate mood, only endurance training also reduces anxiety.[50]

6. Influence of RLS on QoL and exercise on RLS symptoms in HD patients

Restless legs syndrome (RLS) also known as Willis-Ekbom syndrome is described as the spontaneous movement of the limbs (mostly the legs) linked with uncomfortable, occasionally painful sensations that are eased by moving the afflicted limb.[59] According to the most recent evaluation of RLS, it is two to three times more prevalent in individuals with CKD than in the general population. Patients with CKD-A-RLS had higher mortality rates, an increased risk of cardiovascular events, depression, sleeplessness, and a worse quality of life than those with CKD without RLS. People with low levels of physical activity were more likely to suffer from sadness, sleeplessness, and restless legs syndrome, according to a cohort research including 1678 dialysis patients.[60] As a result, patients need to be more aware of the advantages that exercise has for their physical and mental health. In accordance to some research, CKD-A-RLS symptoms can be alleviated by aerobic activity and lavender oil massage, signalling that such therapies may be helpful as supplemental treatments.[61] When compared to both no exercise and exercise without resistance, aerobic resistance exercise considerably reduced the severity of RLS. [59] In uremic patients, a 6-month fitness training program was just as successful in lowering symptoms of restless legs syndrome and decreasing depression scores as a 6-month low dosage dopamine agonist therapy.[62]

7. Conclusions

Our study demonstrated that exercise training is advantageous in alleviating the symptoms of depression and anxiety disorders, poor sleep quality, restless leg syndrome, and fatigue in patients undergoing HD. The findings indicate that exercise training is an efficacious intervention for the symptoms of the disorders, which prevalence rates are significantly elevated compared to those in the general population. These findings underscore the need for comprehensive mental health support and tailored interventions to address both the physical and psychological needs of HD patients. There is an urgent need to include adjusted training plans intradialytic or in any other appropriate time. It is of great importance to maintain patients motivation for exercising and educate them in the matter of potential benefits. Continued research is essential to understand and mitigate the complex challenges, aiming to provide better care for this vulnerable population. These efforts are essential to improving their overall health-related quality of life.

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