



# Physical Exercise on Chronic Kidney Disease Undergoing Hemodialysis: A Literature Review

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**Abstract.** CKD is one of the global health problems due to a decline in quality of life often with the development of kidney dysfunction and increased mortality. CKD is progressive and requires dialysis. Patients who undergoing hemodialysis experience a decrease in physical activity which further adds to the health impact. The purpose of this literature review was to describe physical exercise programs for CKD patients undergoing hemodialysis. The method used was literature review using EBSCO, ScienceDirect, Proquest databases and obtained 8 high-quality articles. Structured physical exercises that can be done by CKD patients are aerobic activity, strength and flexibility. CKD patients should exercise regularly for at least 30 minutes per day, as many as 3-5 times per week with an intensity and frequency adjusted to the patient's condition. Physical exercise improves muscle strength, bones, joints, balance and coordination to increase independence, prevent the risk of falls and cardiovascular disease, blood pressure control and diabetes control, which can reduce physical function and premature death due to CKD. Therefore, physical exercise is an important element in the treatment plan of CKD patients undergoing hemodialysis, but supervision and assistance from health workers are very necessary in the successful planning of the physical exercise program.

**Keywords:** Physical Exercise, Chronic Kidney Disease, Hemodialysis

## 1 Introduction

Chronic kidney disease (CKD) is a global health problem that causes a decline in body function and quality of life of patients along with the development of kidney dysfunction, cardiovascular disease, and an increase in mortality. CKD is progressive and requires dialysis or kidney transplant (1). CKD occurs in about 8-16% of the adult population, especially in people with diabetes and hypertension. CKD affects more than 800 million people worldwide and is closely related to declining life expectancy, especially due to cardiovascular disease (CVD). CKD patients are at high risk of developing myocardial infarction, stroke, congestive heart failure, and arrhythmias (2).

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In addition, patients undergoing hemodialysis (HD) also experience side effects of hypotension, muscle cramps, excessive fatigue, inability to work, and decreased physical activity. Patients tend to be sedentary or less physically active along with the progression of the disease. The Kidney Disease Improving Global Outcomes (KDIGO) has recommended that CKD patients should do moderate physical exercise for 30 minutes every day for a long time, although there is still a high prevalence of CKD patients experiencing physical inactivity at 66-89% (3). Low levels of physical activity and reduced cardiorespiratory fitness further add to the health impact of CKD patients (2). This can reduce the quality of life of patients.

Hypotension that occurs in CKD patients with hemodialysis is due to an imbalance of fluids and electrolytes in the body, causing dizziness. A decrease in blood pressure also occurs in 20-30% as a result of an inadequate cardiovascular response when a large amount of water is expelled during hemodialysis. Muscle cramps that occur generally in the lower extremities at the end of each hemodialysis session are due to differences in magnesium concentrations in dialysis. Meanwhile, the fatigue experienced by patients is due to dietary restrictions, stress, the impact of dialysis on the body, increased muscle catabolism due to insulin resistance, inflammation or acidosis so that it causes muscle fatigue and lack of physical activity. Patients experience insomnia, muscle weakness, bone and joint pain due to renal osteodystrophy which causes the bone layer to become thin and weak (1).

The previous study explained the increase in life expectancy in people experiencing ESRD in India due to lifestyle improvements (1). Therefore, CKD patients in addition to receiving pharmacological interventions, physical activity and exercise are considered as core components of lifestyle modification strategies in the management of CKD. Research explains that physical activity in CKD patients is one of the important elements that can increase muscle mass and oxidative improvement, improve cardiorespiratory function, mental and physical function, maintain the strength and integrity of the patient's muscles, and improve the quality of life. Physical activity recommended for patients with end-stage CKD is physical exercise that has the goal of improving fitness such as gymnastics, in contrast to daily physical activity that causes movement such as doing homework or walking between rooms. Several studies have considered the appropriate physical exercise performed by patients with end-stage CKD. Explaining that intradialytic exercise is effective in reducing fatigue levels in outpatients undergoing hemodialysis in long-term exercise programs. The fatigue that occurs in CKD patients can affect physiological and psychological function (1). Observational studies show that there is a correlation between physical exercise and active movement of CKD patients. There is no evidence that physical exercise can harm patients' condition leading to complications or death. Patients who were given physical exercise for 12 weeks with light intensity 1 time a week achieved an increase of 35-

45% of maximum *heart rate* and 40% of O<sub>2</sub> consumption, while patients given moderate intensity 3 times a week achieved an increase of 45-55% of maximum *heart rate* and 50-60% of O<sub>2</sub> consumption. This will improve the respiratory and cardiovascular function of CKD patients (4).

Physical exercise needs to be considered as a component of the treatment and rehabilitation of CKD patients for all stages. The exercise program provided must be supervised, it can be done at home or while undergoing hemodialysis. Based on the above background, the authors is interested in discussing the literature review "Physical exercises for CKD patients undergoing hemodialysis"

## 2 Method

The method used in the preparation of this article is literature review, which is a search for literature both internationally and nationally which is carried out using EBSCO, ScienceDirect, and Proquest databases. In the initial stage of article search, 16,421 articles were obtained from 2017 to 2023 using the keywords "physical exercise", "End Stage Renal Disease", "physical activity", "chronic kidney disease", "hemodialysis", "exercise intradialytic". All of the above terms and combinations are included. A number of these articles were obtained from 42 relevant articles and taken into 8 high-quality articles.

## 3 Results

Based on the collected and analyzed articles, 8 high-quality articles were obtained that discussed safe and appropriate physical exercise for CKD patients undergoing hemodialysis. The previous research conducted with a randomized controlled trial design, it was found that physical exercise given for 36 weeks including flexibility, dynamic strength, and endurance components was effective in reducing the fatigue level of outpatients undergoing hemodialysis (4). The previous research describe that physical exercise for 20-60 minutes, 3-5 times a week with moderate intensity in large muscle groups such as the quadriceps, back, buttocks and 2-3 times a week with moderate intensity in small muscle groups has been shown to increase endurance and blood sugar in CKD patients with diabetes mellitus (5).

Research of Jeong et al., (2023) performed with design randomized controlled clinical trial in patients given CKD cycling exercise 3 times a wee for 12 weeks possessing neurovaskuler function and sympathetic the decline of neural activity (6). The previous study explained that physical activity can take adult patients with the chronic condition is 150-300 minutes a week or activity of moderate intensity aerobic 75-150 minutes a week due to strong or a combination of both (7). In addition can also recommended strengthening the activity of moderate intensity or larger involving aa the muscles during 2 or more days for a week. But if unable to meet in the guidelines, they

recommended physical activity according to their ability to avoid physical no effective. The previous research performed with design cluster randomized controlled trial multicentre got that joint exercise endurance and durability whet hemodialysis for 12 months to improve physical function and quality of life (8). A metaanalysis of the research conducted by Qiu et al., (2017) used databased in English and Chinese obtained conclusion that the activity of warming, the power, aerobic and exercise at the age of 50 years old useful to improve blood pressure and reducing consumption oxygen in CKD patients (9).

## 4 Discussion

The purpose of literature review was to describe the physical exercise way for CKD patients, especially on hemodialysis. Patients with CKD who undergoing hemodialysis have experienced high risk of disease cardiovakuler (CVD) and progressivity due to disease and less physically. Low levels of physical activity in patients reduced cardiorespiration health, causes patients to lower the quality of their life. Hence pharmacological intervention in addition to getting CKD patients, also received physical exercise as modified a lifestyle in CKD management. The lifestyle results in an increase life expectancy in their end stage disease. KDIGO recommended that patients can do physical exercise of moderate intensity for 30 minutes everyday of the week. Physical activity is recommended physical exercise sports include the flexibility, the power dynamic, and endurance to improve fitness, like gymnastics or aerobic (1). In addtioin, the prevoius study explained that cycling 3 times a week for 12 weeks and drcreased neurovascular can improve muscle sympathetic of neural activity. Training exercise can improve muscle power, the joints, balance and coordination so can increase independence of daily activity such as housework, prevent risks falling, and lower their risk of cardiovascular diseases that can be lowered physical function and early death in patients. Other benefits of physical exercise also include better blood pressure and diabetes control so that patients can avoid cardiovascular amputee disease (4).

Physical inactivity in CKD patients happening due to lack of activity knowledge as disease progressivity, so causes the decline in their daily activity in life and the quality of life. Physical exercise carried out regularly with the intensity of low to moderate significant in health benefits for CKD patients, the improvement of the lungs and heart, neuromuscular, and cognitive patients, and alleviates the symptoms of disease and lipid profile, increase physical function, control blood pressure, increases muscle mass and bone health so as to affect fitness and their quality of life. Sports exercise refer on the type of physical activity comprising bodily movements planned, structured, over and over again to raise and or defend one or more components health condition. Physical exercise can be collected during 30 minutes a day, as many as 3 to 5 times a week the intensity and frequency of tolerance or adapted to the patient condition. Physical

exercise recommended safe done by CKD patients in stable condition and be put in core element in the treatment of CKD patients who undergoing hemodialysis. Supervision and accompanied with the other health worker needed in the success of the program planning the physical exercise in patients. Vital signs patients monitored regularly during exercise program. Exercise stopped if a patient experienced pain or uneasiness, change the physiological function of heart rate, with or without excess fatigue, high blood pressure (over than 180/110 mmHg) (1).

The health worker have to do education and look at the physical function before patients do physical exercise. The other health workers involved in this case is a doctor of nephrology, doctor of physiologist (sports professional), nurses, physiotherapists, psychology, and nutritionist (3). Safe physical exercise for patients is gymnastic, cycling, running warm up, increase the number of daily footsteps, switch spaces, standing longer than usual, walk outside, stretching, a strengthening of limb muscles, or sitting-up activity. Patients can choose [physical exercise according to their physical abilities as well as no constraints that can exacerbate the disease (5). If patients with old age and have the disease can companion, it may be recommended to engage in physical activity with mild intensity.

The previous study explained that physical activity can take adult patients with the condition chronic is 150-300 minutes a week or activity of moderate intensity aerobic 75-150 minutes a week due to strong or a combination of both in addition can also recommended strengthening the activity of moderate intensity or larger involving all the muscles during 2 or more days for a week. But if unable to meet in the guidelines, they recommended physical activity according to their ability to avoid physical in activity (4).

The previous study explained that the given physical exercise for 20-60 minutes, 3-5 times a week of moderate intensity in the large muscles and 2-3 times a week of moderate intensity on improvig the survival of the small muscles and stabilize blood glucose (6). The previous study research performed with design cluster randomized controlled trial multicentre got that joint exercise endurance and durability when hemodialysis for 12 months to improve physical function and quality of life. Exercise intradialytic effective to reduce the rate of fatigue in patients who undergoing hemodialysis (8). Exhaustion that occurs in patients can affect the physiological function and psychological. Nevertheless exercise program must be supervised by health workers and can be done at home or during hemodialysis (3).

Structured activities that can be carried by CKD patients in aerobic activity, the power, and flexibility. Aerobic activity is activities performed by requiring large amounts of oxygen. Type of aerobic sports include treadmill, walk, jogging, up the stairs,

swimming, walking on water, water aerobics, gardening, dancing, cycling or a stationary bicycle, gymnastics seats. The exercise of power is the activity that involves use of the body's large muscles, for example the free or dumbel, resistance bands and pilates machine. The kind of flexibility is moving joints through various movements and assist in reducing risk of injury to physical activity, for example a stretch, yoga, and tai chi (2).

Patients who have never had regular exercise, can start exercise slowly and improve the speed by everyday when the body was comfortable. KDIGO recommended lifestyle for CKD patients is doing at least 30 minutes a day of physical activity, 5 times a week. Start and end the sport with a stretch, exercise, followed by aerobic activity or strength training. Physical exercise to be stopped and seek medical attention if the patient feels asphyxiated, upper body pain, nausea, vomiting, muscle cramps or joint pain, sudden weakness in a limb, impairment of sight, talk, or difficulty swallowing, headache, or giddy (5).

## 5 Conclusion

CKD patients who undergo hemodialysis tend to experience a decrease in physical activity along with the progression of the disease. This will cause a decrease in cardiorespiratory fitness which will further increase the health impact and reduce the patient's quality of life. Physical exercise is recommended as one of the components in the treatment plan program for CKD patients undergoing hemodilysis. Physical exercise improves the strength of the patient's muscles, bones, joints, balance and coordination so that it can increase independence, prevent the risk of falls, reduce the risk of cardiovascular pain through blood pressure control and diabetes control in the patient. Recommended physical exercise that is safe for CKD patients undergoing hemodialysis includes aerobic, strength, and flexibility exercises that are performed regularly for at least 30 minutes per day, as many as 3-5 times per week with an intensity and frequency adjusted to the patient's tolerance or condition.

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