

THE EFFECT OF TAI CHI EXERCISE ON THE ADEQUACY OF HEMODIALYSIS AMONG PATIENTS WITH END STAGE RENAL DISEASE: A LITERATURE REVIEW

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ABSTRACT

End stage renal disease (ESRD) is currently a global problem because of its increasing prevalence. Hemodialysis is the main management in ESRD patients. The importance of assessing the adequacy of dialysis greatly influences the quality and continuity of the patient's life. This paper is a literature review to identify the effect of tai chi exercise on the adequacy of hemodialysis among ESRD patients. The authors used several databases to search for literary sources to be studied, namely Web of Science, EBSCO, PubMed, and Google Scholar. It was found that tai chi is a safe therapy less complications and have beneficial for ESRD patients. Tai chi can suppress bone reabsorption, improve functional balance and strength, increase the rate of blood in the muscles, increase capillary size and surface area which results in increased movement of toxins and urea in cells that move to the vascular eventually towards the hemodialysis machine. In addition, tai chi can be beneficial to make circulation smooth, reduce blood pressure, and facilitate the release of lactic acid so that it can reduce risk factors for cardiovascular disease. Tai chi is recommended as a treatment modality choice to increase the adequacy of hemodialysis in ESRD patients.

Keywords: adequate dialysis, ESRD, hemodialysis, intradialysis exercise, tai chi.

1. Introduction

End stage renal disease (ESRD) is a condition in which the kidneys are damaged and cannot filter blood like a healthy kidney, which will cause excess fluid and failure to release substances from the body so that it can cause other health problems (1). ESRD is one of the problems in the world where around 500 million people worldwide experience stage 3 or greater chronic kidney disease (eGFR <60 mL / min / 1.73 m²) (2). The prevalence of ESRD patients increased by 50% (500 million people) in 2014 (3).

The results of a systematic review also found that the prevalence of ESRD globally was 13.4% (4). In addition, ESRD was also ranked 27th in terms of triggering death incidents in the world in 1990 and has increased until 2010 to be the 18th in the world (5). In Indonesia, statistical data shows that cases of chronic kidney failure are ranked as the second largest in financing in the health BPJS at the hospital (6).

With the increasing incidence of ESRD, a good management for patients is needed. Therapy that can be given to ESRD patients includes peritoneal dialysis, hemodialysis, and kidney transplantation. In handling especially ESRD cases, hemodialysis therapy is one of the therapies that continues to grow and increase every year (7). It was recorded, 92% or 385,851 patients underwent hemodialysis therapy and the remaining 8% or 31,840 patients performed peritoneal dialysis intervention. Other data also explained that in 2014 there were 64.3% hemodialysis, 30.1% were kidney transplants and the remaining 5.2% were peritoneal dialysis (8).

Hemodialysis is the main management in handling cases of ESRD patients (9). The history of hemodialysis starts from a Scottish chemist named Prof. Thomas Graham who in 1854 discovered the principle of separation of materials / substances through semipermeable membranes. In 1912 the first hemodialysis was performed on animals using artificial kidneys. The first hemodialysis in humans was carried out by George Haas in 1914 in Germany. Whereas in Indonesia, hemodialysis was first carried out in 1972 at Cipto Mangunkusumo Hospital Jakarta (10).

In hemodialysis therapy, evaluation in terms of the effectiveness of action is known as adequacy of dialysis. The importance of assessing the adequacy of dialysis is very influential on several factors which include the quality and survival of the patient's life. In addition, adequate hemodialysis can also have a significant impact on financing care, the frequency of care at the hospital and will reduce the mortality and morbidity of the patient (11). Adequacy of dialysis is a successful parameter of hemodialysis action which is associated with the ability to cleanse toxins and body waste and have a large impact on better conditions in hemodialysis patients (12). As for some indicators of increasing movement of uremic toxins in the body in the action of hemodialysis, among others, weight loss or the movement of fluid buildup in the body, avoid intradialysis hypotension, and decrease in urea levels (13).

In connection with the importance of the adequacy of dialysis, there are various actions taken to improve the adequacy of hemodialysis, including exercise intradialysis which is any form of exercise that can be active and passive movements especially in the upper and lower extremities performed during hemodialysis (14). The results showed that the value of leg lean mass flexibility, bone mineral content, and leg strength in the intervention group that carried out intradialysis exercises increased significantly (15). Other benefits also explained that the presence of intradialysis training showed a significant improvement in serum phosphat and potassium levels, and an increase in Hb although the number was not significant (16).

Tai chi is a type of exercise that can be done when dialysis is connected to a machine (17). The tai chi movement is very gentle and every movement uses taste so this exercise does not cause complications in dialysis patients (18). In addition, the tai chi movement can smooth the flow of blood vessels throughout the body because the tai chi movement does not use muscle strength but movements that collect and incorporate energy from the outside in very soft as well as caressing a mother to her child which is the key to balance blood flow in the body (18). This paper will discuss the literature on the effect of tai chi exercise on the adequacy of hemodialysis in ESRD patients.

2. METHOD

The research method was literature review. To collect the data, the authors used several databases included Web of Science, EBSCO, PubMed, and Google Scholar with the keywords "tai chi", "exercise intradialysis", "adequacy hemodialysis", and "hemodialysis". The articles inclusion criteria was (1) the article discuss about the effect of tai chi exercise on the adequacy of hemodialysis among ESRD patients; and (2) English full-text article. In addition, search are limited from January 2006 to Desember 2018.

3. RESULT

a. Taichi exercise

Tai chi is an exercise to improve physical health, mental balance, mentality, and can improve peripheral blood circulation in the hope of removing free radicals and increasing immune responses because tai chi which includes body-mind-soul-breath can make the heart work stable under normal conditions, this is caused by sympathetic and parasympathetic nerve activity being balanced (18). Tai chi can be done by patients without tools, the very minimalist tai chi movement is very good given to patients with extremity limitations because of the attached device, allowing tai chi to be given because tai chi is not focused on tiring concentration but relaxation and tai chi are movements which is very gentle for patients so that the movements carried out do not release muscle strength and do not focus on the movements carried out but unite with the breath and gather energy from the outside in with very large results for patients (18). Tai chi modification for patients undergoing hemodialysis focuses more on physical relaxation, mental concentration, followed by deep breathing (17). Then tai chi exercise when hemodialysis ends with gradual cooling with the aim of re-reducing the body's condition to the level before exercise.

b. The effectiveness of tai-chi on the adequacy

Intradialysis exercise is a structured aerobic exercise program when patients are undergoing dialysis with the aim of increasing the effectiveness of dialysis and is a complementary therapy and safe, effective modality for hemodialysis patients (19). Intradialysis exercise is very good for improving physical function, increasing daily activities, reducing pain and discomfort, and improving sleep quality, reducing psychological problems in patients who have hemodialysis, and finally can improve the quality of life of hemodialysis patients without any side effects (20).

Wong et al. (2011) in the study of Ganik sakitri et al. (21) explained that with low and moderate levels of activity the impact was able to reduce complaints of complications during hemodialysis. The right physical activity and is carried out during the process of hemodialysis (one of which is through tai chi) is able to improve cellular metabolic activity which was previously anaerobic into aerobics without the side effects of fatigue. Another study entitled "Intradialytic modified tai chi exercise supports end-stage renal disease patients undergoing hemodialysis" which can be given at the time of dialysis taking place in the first two hours of a safe dialysis session without causing complications and beneficial for ESRD patients. Besides that, tai chi which is carried out in the second hour of the dialysis session

can also suppress bone reabsorption, improve functional balance and strength and improve quality of life (17).

Tai chi movement is a type of slow motion exercise that can be carried out during the course of the hemodialysis process so it will make several mechanisms in the body physiologically such as an increase in the rate of blood contained in the muscles, the enlargement of capillaries in both area and surface resulting in an increase the movement of toxins and urea in cells moves to the vascular which eventually leads to hemodialysis machines (22).

Other literature explains tai chi can be beneficial to physiological improvements in the body so that it makes the body more agile, strength increases especially in the muscles in the extremity area and can also reduce fatigue in patients because the initial mechanism stimulates capillaries in the muscles that are beneficial for blood vessel growth (23). This activity will make the body work efficiently when delivering oxygen needed by the muscles and also make circulation smooth, the effect of which is a decrease in blood pressure, lactic acid as a result of muscle metabolism will be easy to remove (24).

In addition, the study entitled "Evaluation of Exercise Tolerance in Dialysis Patients Performing Tai Chi Training: Preliminary Study" has proven the effectiveness of regular intradialytic tai chi exercise during dialysis treatment at least twice a week for 45-60 minutes. This can reduce resistance, tissue insulin, and blood pressure, by modifying intradialytic tai chi movements that have been adjusted to the patient's condition to reduce risk factors for cardiovascular disease. Regular tai chi exercises can also cause skeletal muscle hypertrophy to increase fiber surface area in the cross section which increases muscle strength and strength, decreases fatigue, and causes overall improvement in physical function in patients with ESRD and significantly increases physical fitness and improves quality of life and function everyday (25).

4. DISCUSSION

ESRD is a progressive and irreversible renal function disorder in which the body fails in an effort to maintain, fluid and electrolyte balance, and the inability to remove metabolic waste through urine, causing uremia (urea retention and other nitrogenous waste in the blood) (26). Chronic kidney failure is caused by several factors including kidney clearance, decreased glomerulus filtration rate, fluid and sodium retention, acidosis, calcium and phosphate imbalance anemia and uremic bone disease (26).

Tai chi is a type of exercise that can be performed intradially in ESRD patients. The results showed that after the patient performed the tai chi intradialytic movement in the first second hour of the dialysis session for 45 minutes consisting of 5 minutes of warm-up, 35 minutes of tai chi, 5 minutes of cooling along with the respiratory arrangement would improve quality of life, minimize bone reabsorption, and helps to maintain and increase 25-hydroxy vitamin D levels in ESRD patients (16).

There are other benefits that can be obtained through intradialysis tai chi. The study explained that tai chi was considered effective in ESRD patients to improve patients' quality of life, reduce blood pressure and body mass index, maintain normal kidney function, and also improve physical health from quality of life related to health. In addition, tai chi does not cause an increase in metabolic syndrome, lipid levels (dyslipidemia) or fasting glucose levels. In other words, tai chi is very effective in managing a number of risk factors associated with hypertension in adults (24).

In addition, tai chi performed intradialysis can reduce tissue insulin resistance, and blood pressure so that it can reduce risk factors for cardiovascular disease. In other words, tai chi causes an overall increase in physical function in patients with ESRD and significantly increases physical fitness and improves quality of life and daily functions (25).

5. STUDY LIMITATION

The limitation of this paper is the type of method used. We used the literature review so that the writing method not systematic and does not go through the biased assessment process.

6. CONCLUSION AND RECOMENDATION

ESRD which is a condition in which the kidneys are damaged and cannot filter blood like a healthy kidney is currently a global problem due to its increasing prevalence. Hemodialysis is the main management in ESRD patients. Intradialysis Tai chi is a therapy that is safe, does not cause complications and is beneficial for ESRD patients. Intradialysis Tai chi can suppress bone reabsorption, improve functional balance and strength, increase the rate of blood in the muscles, increase capillary size and surface area which results in increased movement of toxins and urea in cells that move to the vascular eventually towards the hemodialysis machine. In addition, tai chi can be beneficial to the physiological improvement of the body which makes circulation smooth, the effect of which is a decrease in blood pressure, lactic acid as a result of muscle metabolism will be easy to remove, and reduce risk factors for cardiovascular disease Tai chi is recommended as a treatment modality choice to increase the adequacy of hemodialysis in ESRD patients.

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