CHAPTER 1

Introduction

Rationale

Chronic kidney disease (CKD) is defined as kidney damage or decreased kidney function (glomerular filtration rate (GFR) < 60 mL/s min per 1.73 m^2) for three months or more (1). The clinical features in CKD due to deterioration of renal function are anemia, fluid buildup in the tissues, loss of bone minerals, hypertension, fatigue, shortness of breath, loss of appetite, restlessness, change in urination patterns, and overall malaise, which cause a decrease in physical well-being (1, 2).

Restless legs syndrome (RLS) is a neurological disorder characterized by sensorimotor symptoms such as paraesthesia and restlessness that mainly affects the lower limbs and becomes worse during inactivity (3). These unpleasant sensations occur during rest in the evening or overnight and are partially relieved by movement (3). RLS is common among patients who receive hemodialysis therapy, a condition known as uremic RLS. The prevalence of RLS is higher in dialysis patients (12% to 62%) when compared to the general population (5% to 15%) (4). The prevalence of RLS in hemodialysis patients in Thailand is 45.5% (35). A previous study (5) found that RLS patients had decreased iron levels in the substantia nigra and decreased cerebral spinal fluid ferritin and iron concentrations with normal serum iron stores. It was reported that the possible causes of RLS in hemodialysis patients is anemia, a decrease of serum ferritin and serum iron levels with reduced calcium and phosphorus levels, and an increase of creatinine and urea levels in the blood (6). RLS was also found to be associated with poor sleep (7, 8). According to RLS severity, decreased physical performance and physical function and an increasingly dependent life style (3, 4, 9) were causes of a low quality of life and increased mortality and morbidity in patients who were treated with long-term hemodialysis (9, 10). RLS have been associated with poor mental health and symptoms associated with lower HRQOL in the general population and hemodialysis

population. Therefore, RLS in hemodialysis has been associated with shorter survival (11). Hemodialysis treatment has been associated with decreased muscle size in hemodialysis patients, leading to avoidance and lack of exercise that may affect physical performance (12). A skeletal muscle morphology study in patients with RLS showed that RLS patients had lower maximal oxygen uptake than healthy subjects (13). Uremic RLS patients were found to have a reduced size of their proximal leg muscles and a decrease in the mental health component of quality of life using the sleep aspects of the SF-36 questionnaire (14). However, there was no difference in physical performance such as sit-to-stand ability and walking speed, body and muscle composition, and physical health of quality of life between hemodialysis patients with and without RLS (14).

Hemodialysis patients had low peak oxygen uptake (VO_2 peak), reduced physical performance, and low exercise tolerance (15). Johansen et al. (12) investigated muscle atrophy in patients receiving hemodialysis without RLS and found that hemodialysis patients had poor physical performance with a high level of weakness. The effects of both uremia (7) and sleep disturbance in hemodialysis patients with RLS were associated with reductions in circulating anabolic hormones (16, 17). Therefore, RLS could affect muscle metabolism. It is indicated by the ability to sleep that a lack of sleep is associated with reduced muscle size in hemodialysis patients (14). Moreover, the characteristics of RLS within the repeated movement-relaxation cycle affect physical activity. A previous study (9) found an increased prevalence of heart disease in RLS patients. Moreover, Schlesinger et al. (18) found that RLS patients had a lower level of physical fitness than non-RLS patients. RLS patients were less fit, heavier, had higher BMIs, and had a history of smoking. In addition, RLS patients had a higher prevalence of hypercholesterolemia, lower HDL serum levels, a decreased HDL/LDL cholesterol ratio, higher fasting glucose concentrations, and reduced renal function (18). Therefore, all of those risk factors might affect cardiopulmonary fitness in RLS patients who are undergoing hemodialysis treatment. Finally, hemodialysis patients have had a high prevalence of RLS, and in fact RLS has effects on aspects of physical performance, physical function, and quality of life such as endurance and muscle size, which research on hemodialysis patients has shown are confounded in the past (14). As of now, the

association between cardiopulmonary fitness and RLS in hemodialysis patients has not been conclusively identified. Although there was a study on physical performance and muscle characteristics in hemodialysis patients with RLS, the results are not clear. Therefore, the purpose of this study is to compare physical performance in CKD patients with and without RLS who have been receiving hemodialysis treatment.

Purposes and hypotheses of the study

1. Research question

Are there any differences in physical performance between hemodialysis patients with and without RLS?

2. Hypothesis

Hemodialysis patients with RLS would have lower physical performance than hemodialysis patients without RLS.

3. Purpose

The purpose of this study was to compare physical performance between hemodialysis patients with and without RLS.

4. Advantages of the study

The results of this study will be used as preliminary information regarding physical performance in hemodialysis patients with and without RLS. Moreover, the results will be applied to the design of appropriate exercise programs for this patient group.