

## CHAPTER I

### INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is characterized by airflow limitation and inflammation of the airways and the lungs (1). The clinical manifestations in COPD are chronic cough, sputum production, dyspnea, exercise intolerance, deconditioning, and decreased quality of life (QOL) (2). COPD has diverse effects, including respiratory and peripheral muscle weakness, weight loss, impaired cardiovascular system, and abnormalities of the autonomic nervous system (3).

Anemia is a common condition associated with chronic diseases such as chronic heart failure (CHF), chronic kidney disease (CKD), cancer, rheumatoid arthritis (RA), and COPD (4, 5). The clinical symptoms of anemia in chronic diseases are weakness, fatigue, cachexia, impaired nutrition, and exercise intolerance (6). Previous studies have shown that proinflammatory cytokines such as tumor necrosis factor-alpha (TNF- $\alpha$ ), interleukin-6 (IL-6), interleukin-8 (IL-8), and C-reactive protein (CRP) are increased in patients with COPD, similar to the mechanisms of anemia (2, 3). Other studies have suggested that anemia contributes to exercise intolerance and dyspnea in chronic diseases (7, 8). Additionally, the anemia in COPD contributes to increased mortality, decreased gas exchange and hemodynamic, abnormal breathing, and skeletal muscle dysfunction (9). Therefore, the anemia associated with COPD may further reduce exercise capacity in COPD patients.

The six minute walk test (6MWT) is a valid and reliable tool for the evaluation of the pulmonary, cardiovascular, and musculoskeletal systems during exercise in chronic diseases patients, including those with COPD (10). This test can indirectly determine the exercise capacity in moderate to severe COPD patients, and yields similar values of peak oxygen consumption ( $VO_2$ ) to the incremental exercise test (11). The 6 minute walking distance (6MWD) is used to assess exercise capacity (10). The 6MWD, heart rate, and oxygen saturation immediately after 6 MWT ( $HR_{im}$  and  $SpO_{2im}$ , respectively) have been used as predictors of the prognosis in moderate to severe COPD patients (10, 12, 13). A study with CHF and CKD patients reported that anemia was the main factor that decreased exercise capacity as indicated by reduction in 6MWD (7, 9, 14). However, such a study has not been done with COPD patients. Therefore, the present research aimed to evaluate the exercise capacity in COPD patients with and without anemia, by using the 6MWT.

### **Research question**

Are there any differences in 6MWD,  $HR_{im}$ , and  $SpO_{2im}$  among normal subjects, COPD patients with and without anemia during 6MWT?

### **Hypothesis**

1. COPD patients with anemia would have lower scores in 6MWD than normal subjects and COPD patients without anemia during the 6MWT.

2. COPD patients with anemia would have higher scores in HRim than normal subjects and COPD patients without anemia during the 6MWT.
3. COPD patients with anemia would have lower values of SpO<sub>2im</sub> than normal subjects and COPD patients without anemia during the 6MWT.

### **Purpose**

The purpose of this study was to compare 6MWD, HRim, and SpO<sub>2im</sub> among normal subjects, COPD patients with and without anemia during 6MWT.

### **Application advantages**

1. The results of this study may show differences in exercise capacity in COPD patients with and without anemia.
2. The result of this study may help physical therapists and other clinicians prescribe exercise and set precautions for exercise in anemic COPD patients.
3. The results of this study may help physician to make a clinical decision on further treatments.