

## An evidence-based approach in the management of fatigue due to heart failure: breathing exercises

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### ABSTRACT

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Fatigue is one of the common symptoms that adversely affect the quality of life of patients with heart failure. It has been reported that fatigue seen in heart failure is caused by conditions such as deterioration of peripheral circulation due to decrease in oxygen delivery, autonomic nervous system abnormalities and deterioration in the strength of the respiratory muscles. Breathing exercises are one of the integrative applications that can increase oxygen delivery due to the functional connection of the heart and lungs providing relief from fatigue. In the literature, breathing exercises have a wide range of breathing techniques that create

changes in breathing form and rate. Many studies have found that breathing exercises reduce fatigue, and can have significant effects on patient care and clinical outcomes. Nurses have a major impact on patient outcomes such as reducing fatigue in heart failure patients and improving health-related quality of life. For this reason, it is very important to include breathing exercises in nursing practices. In this regard, the importance of breathing exercises in the management of fatigue due to heart failure has been addressed in this review.

**Keywords:** Breathing exercises; fatigue; heart failure; nursing care

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## INTRODUCTION

Heart Failure (HF) is a global health problem that has an increasing incidence. Its prevalence in adult population is 2.9% in our country, which is higher than in western countries [1]. In HF, which occurs as a result of some etiological factors, heart flow decreases and fluid builds up in the body [2] resulting in the failure of the heart in providing the oxygen that tissues need [3], and some symptoms begin to appear in the person. One of these common symptoms is fatigue [2-5]. Since fatigue affects quality of life negatively [6,7], effective management of this problem will improve the quality of life of the patient [6]. Breathing exercises, which are among the approaches used in the management of fatigue, are applied to increase the providing of more oxygen to tissues and to ensure body-mind balance with the correct use of breath [8,9]. With this application, the oxygen needed by the tissues is taken into the body thanks to the correct breathing technique; and in this way, further energy can be provided to the cells to eliminate fatigue [9]. The purpose of this review is to determine the importance of breathing exercises in the management of fatigue, which affects the daily activities of patients with heart failure reducing quality of life.

### Fatigue in heart failure

Although the most common cause of heart failure is myocardial ischemia, HF may develop for many different reasons. No matter what the cause is, the cardiac flow in HF decreases in time resulting in accumulated fluid in the body [10]; revealing many symptoms such as shortness of breath, orthopnea, paroxysmal nocturnal dyspnea, peripheral edema and fatigue [3,10-12]. Fatigue, which is among the most common symptoms, is reported to change between “moderate to high” levels of incidence in HF patients [4,7,11]. Also, fatigue was described as a nursing diagnosis by the North American Nursing Diagnoses Association (NANDA) in 2002 as “*The individual’s capacity to work physically and mentally, feeling tired and resting and fatigue not passing*” [13]. According to this definition, it is concluded that fatigue is a highly complex and multidimensional symptom affecting daily life in Heart Failure [14]. Because of the limitation of physical activities in fatigue [14,15], different psychological and social problems emerge [11,14] (i.e. reduced energy, sleepiness, frustration, depression, desperation, lack of motivation, and social isolation) [14], accompanied by shortness of breath, causing serious functional limitations that may destabilize patients’ quality of life [7,11]. In this respect, integrative applications such as breathing exercises are made use of especially in the management of psychological problems experienced by patients diagnosed with HF [12].

Also, oxygenation disorder, electrolyte imbalance [12], or edema-related dyspnea in patients with HF also trigger fatigue. Depending on all these factors, the level of fatigue and how the individual manages this problem in his/her daily life affects the management of heart failure in return [14].

### Breathing exercises

From the past to our present day, the meaning associated with breath has been special, and different religions and cultures have used the same expressions for breath and soul [16]. The meaning of “breath” (“*nefes*” in Turkish) that has passed from the Arabic Language to our language [17] is considered the origin of the word meaning breath, spirit, life, self [16]. Physiologically, breathing is the intake of the oxygen needed by cells to sustain life and the removal of wastes from the body [9]. Breathing exercise means to make changes in the form and number of breaths with different breathing techniques [9,18]. Breathing techniques are among integrative approaches that do not require equipment [9], cost-effective [18], easy-to-learn and apply, safe and can be done in all areas [9,19,20]. However, it is important to take care that the medium where breathing techniques are applied are far from stimuli, quiet and calm with abundant oxygen, suitable for the lungs in terms of heat and humidity [8,16]. Breathing exercises and methods of applying inspiratory-expiratory muscle training include basic breathing exercises, yogic breathing exercises or methods driven by a device aimed at lowering the respiratory frequency rate to less than 10 breaths per minute [21]. Although a wide range of breathing exercise types were reported in the literature varying from exercises in which only the inspirational muscles or diaphragm muscle are used to breathing exercises in which the lung is filled with full-capacity breath or in which breath is taken with the lips and given slowly [8,9,16,22,23], it is emphasized that regular implementation of programs with different breathing techniques will have very strong effects in general in the long term [8,9]. However, the durations of session and application programs vary in studies addressing breathing exercises [19,20,22-27]. For example, in a study conducted on gynecological cancer patients receiving chemotherapy, it was observed that when attention was focused on the lower abdomen, and when relaxing breathing exercises are applied with deep breaths, fatigue was reduced [22]. In a study aimed to increase lung capacity, the group of healthy adults underwent a program consisting of three different pranayama breathing techniques for six weeks, three days a week, in 10-minute sessions. This program included Dirga Svasam (full yogic breath), Kapalabhati (Skull-Shining Breath), and Nadi Shodhana (alternate nasal breath) as breathing techniques. As a result, it was found in the study that there were significant improvements in the lung

capacity of the intervention group compared to the placebo group [20]. Below some breathing techniques that can be used in heart failure are given.

### **Diaphragmatic Breathing Exercise**

The most important of the muscles that are active in inspiration is the diaphragm [9,16], it also works actively in the expiration process [16]. It was shown in previous studies that breathing exercises in which the diaphragm is activated improved various physiological indicators such as heart rate and respiratory rate [19]. It was also reported that the most common breathing techniques used to reduce fatigue were abdomen and chest breath to strengthen the diaphragm and intercostal muscles. Breathing techniques were used as slow and deep applications in these studies [22,23]. It was also stated that diaphragmatic breathing exercises and yoga breathing techniques can be applied in the same program for the individual to benefit at the highest level [21].

### **Full Yogic Breathing**

This is the breathing technique in which abdominal, thoracic, and clavicular breathing stages are combined with breathing with the nose in sitting position to ensure full capacity functioning of the lungs and to increase oxygen intake [15,16]. This breathing technique was found to bring benefits to healthy individuals in heart rate changes [15].

### **Nadi Shodhana (Alternate Nostril Breathing)**

This is the breathing technique applied in the form of alternate breathing with the left and right nostrils and returned through the same nostril [16,18], which allows the body and mind to balance [16]. In a study conducted by Bhagat et al. to examine the effects of Nadi Shodhana breathing exercise on the cardiovascular system and the underlying mechanism [5], Nadi Shodhana exercises were applied per minute to 12 healthy individuals. In 5-minute measurements before, during and after the application, it was found that the exercise had beneficial effects on autonomic regulation of the cardiovascular system compared to pre-application values [28]. The reason of this effect stemmed from the balancing of sympathetic and parasympathetic systems with Nadi Shodhana breath exercise.

### **Bhramari (Honeybee Humming Breath)**

In this technique, the ears are closed after a complete inhalation using the fore fingers, and breath is taken with a soft humming sound that is similar to the sound of a honeybee [9,16,18]. This method, which can be applied in different versions, calms the mind, removes the fear and anxiety, balancing the autonomic system [16]. Bhramari Exercise can be repeated 5-10 times [9,16]. In a single-group study, the participants applied 6 Bhramari Breaths per minute for five minutes, and it

was seen that blood pressure and heart rate decreased in the individuals in the intervention group. According to the results of the study, it was concluded that the parasympathetic system was activated [29].

## **RESULTS OF EVIDENCE-BASED BREATHING EXERCISE IN MANAGING FATIGUE DUE TO HEART FAILURE**

Although approximately half of heart failure patients experience fatigue [5], a small number of studies were conducted on this subject, and the biological mechanism that causes fatigue has not been fully elucidated [28,30]. Possible causes of autonomic nervous system abnormalities [7,30] were reported as decrease in oxygen delivery due to deterioration of peripheral circulation, and deterioration in respiratory muscle strength [7]. It was also found that the severity of fatigue in patients was associated with age, right and left ejection fraction, New York Heart Association (NYHA) stage, peripheral edema, and paroxysmal nocturnal dyspnea [7]. As it is already well-known, since there are two organs associated with the functions and compulsive mechanisms of the heart and lungs providing oxygen to the body [21,28], the fatigue in HF patients is often experienced with dyspnea [21], which reduces the quality of life of patients significantly [24]. Breathing exercises and inspiratory muscle training are considered as an important strength in improving exercise and functional performance with the link of dyspnea and fatigue symptoms in heart failure patients [21]. If not adequate oxygen is provided to the cells, it is tried to be compensated by accelerating the heart beat and increasing blood pressure. With breathing exercises, heart beats and breathing exchanges become synchronized after some time [8]; oxygen and carbon dioxide exchange increases in the lungs, it becomes easier for the heart to provide more oxygen. This contributes to the reorganization of the cardiovascular system and its ability to continue its task [8,9].

Breathing exercises may be applied with the control of the individual [15,19,20], or with the help of a device [24,27,31,32] in the form of changing the breathing form. There are studies reporting that the patient is provided with sufficient oxygen with a small number of breaths by applying breathing exercises, as well as other studies that ensure positive changes in heart rate variability and blood pressure [29], and there are also some other study results showing that breathing exercises very rarely have no effects on blood pressure and heart rate [32]. However, studies including different types of yoga breathing techniques or basic breathing techniques generally reported that exercises are an effective approach for preventing and improving cardiovascular disorders [21]. In some studies

conducted on HF patients, the number of respiration per minute was reduced with the help of a device, which increased the amount of oxygen and cardiovascular capacity, functional performance and vagal activity in the body [32]; positive changes in autonomic heart control (e.g. a decrease in systolic blood pressure), improvement in ejection fraction, a decrease in pulmonary artery pressure, and an increase in quality of life [31]; decrease in dyspnea and improvement in NYHA Stage [27,31]. Also, in some studies in which the effects of breathing exercises on fatigue were evaluated, decreases were detected in fatigue levels [24,27], and it was reported that these techniques were based on slowing down the breathing with significant effects on patient care and clinical outcomes [32]. These results also make it possible for devices aiming to reduce the respiratory count for using in HR patients [31]. In studies conducted with patient control, it was found that dyspnea decreased; however, the amount of oxygen provided to the body was increased [33], and improvements were seen in functional exercise capacity [26,33]. Again, in a study conducted to investigate dyspnea and fatigue, patients reported that there was a decrease in dyspnea instead of fatigue, which may indicate positive support of exercise in the heart-lung complex [31]. Only one study was found in the literature showing that breathing exercises did not have a beneficial effect on fatigue [25].

### **The role of the nurse in breathing exercises applied in heart failure**

The fact that heart failure is a chronic condition with a complex nature [10,34]; causes the appearance of many symptoms that are not specific to the disease. It is not adequate alone for nurses who provide care for HF patients to evaluate and record these symptoms [35].

Studies conducted on patients report that nurses have active roles in reducing symptoms, improving health-related quality of life [34-36]. Nurses show these roles of theirs by ensuring the application of medical treatments of HF patients, with patient monitoring, patient training, and in compliance with the diseases of patients. It is required that nurses use of energy protection techniques during daily life and self-care activities to reduce HF fatigue, which adversely affects all these processes [35].

Breathing exercises; however, improve symptom management of HF patients at home [27] also improving their quality of life [31]. In studies in which breathing exercises are applied alone or at the same time by nurses as different nursing initiatives, it was found that these exercises provided good benefits to patients [19,24,27].

For this reason, it is very important that nurses know the benefits of breathing exercises [33], and that breathing exercises are learned by nurses

[19]. However, patients need courage in the continuous application of breathing exercises. For this reason, nurses are also required to encourage patients to exercise for breathing [33]. It is recommended in the literature that the effectiveness of these applications should be increased by supporting patients (when necessary) face-to-face or with videos/live links [27,33]. Patients faith in these applications should also be supported [33]. In the light of this information, it must be ensured that nurses' knowledge and practices for breathing exercises are developed [19,33], giving exercise training to patients by nurses, supporting patients who have just learned breathing exercises [19,27,33], the individuality of exercises [19,33] and regular follow-up by nurses to see the long-term effects of exercises [33].

This study has some limitations that should be mentioned. Firstly, this review article was made using traditional methods. Another limitation of this study is that it only focuses on some breathing exercises. We recommend conducting systematic reviews and meta-analyses involving breathing exercises in the management of fatigue due to heart failure in the future.

### **CONCLUSIONS AND RECOMMENDATIONS**

Since breathing exercises are not interventional or pharmacological, they can be easily applied by everyone [22,24], it is possible to take part in routine procedure [22].

In this respect, it is very important that nurses who are primarily responsible for patient care understand the importance of breathing exercises, and place breathing exercises in nursing interventions, reflect evidence-based patient results to the clinic, and follow current guidelines [33].

However, since the mechanisms of action of breathing exercises have not been elucidated yet [18]; there is a need for detailed research with larger samplings investigating this mechanism [18,26,29,31].

However, since knowing the benefits of breathing exercises by the patient can cause problems in measuring the efficacy in HF symptoms, it is recommended that studies are conducted in the blind design [31].

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