**Comparison of Cardiorespiratory Fitness, Respiratory Muscle Strength and Endurance Levels of Individuals with Metabolic Syndrome with Healthy Individuals**

Hilal Uyar1, Naciye Vardar-Yağlı1, Melda Sağlam1, Ebru Çalık Kütükcü1, Mehmet Fatih Sanver2, Oğuz Abdullah Uyaroglu3, Murat Özdede3, Mine Durusu Tanrıöver3

1Hacettepe University, Faculty of Physical Therapy and Rehabilitation, Department of Cardiovascular Physiotherapy and Rehabilitation, Ankara, Turkey.

2Kütahya Health Sciences University, Tavşanlı Health Services Vocational School, Department of Therapy and Rehabilitation, Kütahya, Turkey.

3Hacettepe University Faculty of Medicine, Department of Internal Medicine, Department of General Internal Medicine, Ankara, Turkey.

**Backgraund and aim:** Low levels of CRF have been associated with the constellation of metabolic abnormalities that constitute MetS. Maximal oxygen consumption (VO2max) is the gold standard for objective assessment of CRF(1). This study aimed to compare VO2max, respiratory muscle strength and endurance in individuals with MetS with healthy individuals.

**Methods:** 37 individuals diagnosed with MetS (50.81±5.31 years) and 20 healthy individuals (50.65±9.96 years) were included in this study. Demographic and clinical characteristics of the individuals were recorded. Respiratory muscle strength maximal inspiratory pressure (MIP), maximal expiratory pressure (MEP) were evaluated using a portable mouth pressure measuring device (MicroRPM; Micromedical, Kent, United Kingdom), respiratory muscle endurance according to the constant workload principle with Power Breathe (HaB International Ltd. Southam, England) and VO2max was measured by cardiopulmonary exercise test (CPET)(2, 3).

**Results:** The demographic characteristics of the individuals were similar (p>0.05). VO2max (kg/ml/min), expected VO2max (%), MIP (cmH2O), MEP (cmH2O) and respiratory muscle endurance (cmH2O\*sec) were found to be lower in individuals with MetS than in healthy individuals (p<0.05).

**Discussion and Conclusion:** VO2max, the most important indicator of CRF, decreased in individuals with MetS. It is known that high CRF strengthens anti-inflammation by suppressing pro-inflammation, protects against MetS by increasing insulin sensitivity, glucose metabolism and fatty acid oxidation(4). Respiratory dysfunction is associated with mortality from cardiovascular and other causes of death. Studies have shown that systemic inflammation may cause airway limitation due to the risk factors involved in METS, which is a clinically complicated disease, and an increase in pro-thrombotic and pro-inflammatory tendencies(5). When planning cardiac rehabilitation programs in patients with MetS, determining CRF levels and respiratory functions and determining individual exercise programs to increase these should be taken into consideration in the treatment of MetS.

​**Keywords:** Metabolic syndrome, cardiorespiratory fitness, maximal oxygen consumption, respiratory muscle strength.

1. Hassinen M, Lakka TA, Savonen K, Litmanen H, Kiviaho L, Laaksonen DE, et al. Cardiorespiratory fitness as a feature of metabolic syndrome in older men and women: the Dose-Responses to Exercise Training study (DR's EXTRA). Diabetes care. 2008;31(6):1242-7.

2. Laveneziana P, Albuquerque A, Aliverti A, Babb T, Barreiro E, Dres M, et al. ERS statement on respiratory muscle testing at rest and during exercise. European Respiratory Journal. 2019;53(6).

3. Radtke T, Vogiatzis I, Urquhart DS, Laveneziana P, Casaburi R, Hebestreit H. Standardisation of cardiopulmonary exercise testing in chronic lung diseases: summary of key findings from the ERS task force. Eur Respiratory Soc; 2019.

4. Bull FG, S.; Lambert, V.; Pratt, M. . Physical Activity for the Prevention of Cardiometabolic Disease.In: Prabhakaran D, Anand, S., Gaziano, T.A.,, Mbanya JC, Wu, Y., Nugent, R., Eds.; T, editors. In Cardiovascular, Respiratory, and Related Disorders. The World Bank: Washington, DC, USA, 20172017.

5. Baffi CW, Wood L, Winnica D, Strollo Jr PJ, Gladwin MT, Que LG, et al. Metabolic syndrome and the lung. Chest. 2016;149(6):1525-34.