HEART FAILURE WITH PRESERVED EJECTION FRACTION AND OBESITY: A REVIEW

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Abstract
Heart Failure with Preserved Ejection Fraction (HFpEF) is becoming more common as the United States (U.S.A) population ages, along with the present of obesity pandemic. In general, HFpEF is the most common type of heart failure (HF) found in general population, however, the elderly, especially women are mostly suffering from it. It is primarily caused by obesity, hypertension, coronary artery disease, and diabetes. Obesity is frequent in individuals with HFpEF. However, it may constitute a distinct phenotype of HFpEF, with distinct hemodynamic and anatomical problems. Obesity causes a systemic inflammatory response which can lead to cardiac fibrosis and endothelial dysfunction. Because most obese patients are still excluded from HFpEF clinical trials, further research is needed to evaluate the role of pharmacologic and interventional treatments in this expanding group. Thus, this review study will aid in the understanding of HFpEF and its association with obesity.

Keywords*:* Heart failure with preserved ejection fraction, Obesity, HFpEF, Heart failure

Introduction

Heart failure (HF) can emerge even when the pumping functionality is normal, or the left ventricular ejection fraction is intact. Industrial nations continue to see increases in HFpEF due to the increased prevalence of typical risk factors, such as aging, females, hypertension, metabolic syndrome, and renal dysfunction (1, 2). Obesity-related HFpEF is a prevalent phenotype in the population, particularly patients suffering from metabolic diseases such as dyslipidemia and diabetes. These patients have a significant increase in plasma volume. However, their ventricular distensibility is restricted. This scenario occurred due to cardiac microvascular dysfunction with myocardial and pericardial fibrosis. Even while systolic ejection is not impeded, the increase in plasma volume generates a uneven rise in ventricular perfusion pressure, resulting in HF (3). This disease is thought to be linked to an elevation in the synthesis of adipocyte-derived cell-signaling molecules, such as aldosterone and neprilysin, as well as the actions of other adipocytokines (4). When no valve disease or pericardial disease is present, HFpEF can be diagnosed clinically by detecting HF and preserved ejection fraction (> 50%) on echocardiography. Overweight and obese individuals who are at risk of heart failure typically have higher outcomes compared to those who are normal weight or underweight. MAGGIC or also known as The Global Group in Chronic Heart Failure discovered a link between body mass index (BMI) and mortality in both Heart Failure with Reduced Ejection Faction (HFrEF) and HFpEF cases after they conducted a meta-analysis (5).

Obesity

Obesity is a growing global health concern. It is more likely that obese patients will suffer from cardiovascular disease (CVD), gastrointestinal disorders, type 2 diabetes (T2D), joint and muscular disorders, respiratory problems, and psychological problems, all of which can negatively affect their daily lives and increase their mortality risk. In spite of this, even a small weight loss can help lower a person's risk of CD, diabetes, obstructive sleep apnea, and hypertension, among a number of other illnesses. (6). Patients that's able to reduce their weight by 5% may improve their outcome. A health care practitioner is ideally positioned to help patients achieve their weight loss goals and overall wellness. By assessing

the patient's prognosis, they will assist with creating realistic weight loss targets for their patients, along with motivation, necessary knowledge and treatment tools to achieve these goals. In addition to a structured lifestyle, they will also provide effective tools to support their patients maintain weight loss (7).

The Epidemic of Obesity

According to the World Health Organization (WHO), fat accumulations that pose health risks are considered overweight and obese. A body mass index (BMI) of 25 kg/m^2 is considered overweight, while BMI of 30 kg/m^2 is obese. There is a high incidence of obesity and overweight worldwide, both in developed and developing countries (7, 8). **In** 2015, the United States (U.S.A) obesity rates were greater than 20%. 25 states including Guam's recorded obesity rates was greater than 30%. While four of the 25 states (Alabama, Louisiana, Mississippi, and West Virginia) obesity rates were greater than 35%. In the U.S.A., approximately 35% of adult men and 37% of adult women are obese (9). The most obese group is non-Hispanic black Americans, followed by non-Hispanic white Americans, and then Mexican Americans (9). Furthermore, obesity rates are increasing at an earlier age. For instance, at the age of 20–29 (people from 1966 to 1975 and 1976 to 1985) had an obesity rate of 20%, while those born between the year 1956 to 1965 had an obesity rate of 30% (10). Furthermore, childhood obesity among children aged 2 to 17 in the U.S.A has increased from 14.6% (for those born between the year 1999–2000) to 17.4% (for those born between the year 2013–2014) (11). There is a growing concern about childhood obesity due to the early onset of comorbidities that can have serious health consequences, as well as the greater likelihood of obese children becoming obese adults in the future (12).

Relationship Between Obesity Phenotypes, Cardiac Function, And Cardiopulmonary Fitness

Body mass index (BMI) has various drawbacks since it examines heaviness rather than body composition. Individuals with increased BMI may not necessarily have increased fat mass, whereas those with normal BMI may have increased fat mass (8, 14). Thus, instead of BMI, a precise measurement of body composition may play a critical role in the development and progression of HF, as listed in Table 1.

Table 1: Relationship Between Obesity Phenotypes, Cardiac Function and Cardiopulmonary Fitness (14)

	Normal weight	Muscular man	Non-sarcopenic obesity	Sarcopenic obesity
BMI (kg/m²)	18.5-25	> 30	> 30	> 30
Fat mass	Normal	Decreased	Increased	Increased
Lean mass	Normal	Increased	Increased	Decreased
Cardiac function	Normal	Normal	Mild dysfunction	Severe dysfunction

Whenever sarcopenia and growing fat mass are present, body composition problems, may follow. Sarcopenic obesity is exceedingly common and is associated with poor prognosis in heart failure patients (15). A large prospective cohort of studies with a significant number of individuals found that sarcopenic obesity showed 24% higher risk of all-cause death compared to non-sarcopenic obesity (16). Thus, it is critical to identify individuals with sarcopenic obesity as early as possible for improving these patients' prognosis.

Campbell et al. (17) described the findings of their intriguing study that concentrated on threshold BMI and sex-specific waist circumference for the elevated risk of HFpEF. Their study involved 3,842 participants aged 60 and older who had self-reported treatments for hypertension or diabetes for 2 years or longer; myocardial infarction, or other ischaemic or valvular heart disease; irregular or rapid heart rhythm; cerebrovascular disease; or renal impairment. They found that 271 non-HF-related deaths occurred after a 5.6-year follow-up among participants with these conditions. They have also shown that keeping BMI and waist circumference below a threshold in a community might lower the occurrence rate of HFpEF by up to 50%. They discovered that a BMI of 27.5 kg/m^2 or higher could be ascribed to 32 of 73 patients (44%) and a waist circumference above these limits could be related to 36 of 73 cases (49%) (17).

Conclusion

There is a substantial morbidity and mortality rate associated with HFpEF, hence making it a major public health concern. This type of HF is resistant to therapy with medicines commonly used for HFrEF, and the ability to alter the natural history of the disease has never been better. Recent developments include new drugs will improve prognosis beyond foundational neurohormonal therapies. It is believed that new drugs for HFpEF will enhance treatment results soon, in tandem with the management of obesity below the thresholds of BMI and waist circumference.

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