

INTISARI

Pendahuluan: Gagal jantung dengan fraksi ejeksi terjaga (*heart failure with preserved ejection fraction*, HFpEF) merupakan salah satu penyakit kardiovaskular yang prevalensinya terus meningkat dan ditandai oleh adanya gejala utama berupa intoleransi saat latihan. Penilaian tekanan pengisian ventrikel kiri melalui rasio E/e' pada pemeriksaan ekokardiografi seringkali digunakan untuk mengevaluasi fungsi diastolik, tetapi kemampuan dalam merefleksikan kapasitas fungsional selama latihan fisik masih terbatas. *Cardiopulmonary exercise testing* (CPET) dapat memberikan gambaran integratif terkait respon kardiovaskular, respirasi, dan metabolik selama latihan.

Tujuan: Penelitian ini bertujuan untuk mengetahui hubungan antara rasio E/e' dengan konsumsi oksigen maksimum (VO_2 max), efisiensi ventilasi (VE/VCO₂ slope), dan *oxygen pulse* (VO_2 /HR) pada pasien HFpEF.

Metode: penelitian ini merupakan studi observasional analitik dengan desain *cross sectional*. Subjek penelitian adalah pasien HFpEF yang menjalani pemeriksaan ekokardiografi dan CPET menggunakan *ergocycle* dari bulan Maret – Desember 2025. Data rasio E/e' diperoleh dari rekam medis pemeriksaan ekokardiografi transtorakal, sedangkan data VO_2 max, VE/VCO₂ slope, dan VO_2 /HR diperoleh dari pemeriksaan CPET. Analisis statistik dilakukan untuk menilai hubungan antara rasio E/e' dan parameter CPET.

Hasil: Hasil penelitian menunjukkan bahwa subjek HFpEF memiliki kapasitas latihan yang rendah dengan variasi nilai VO_2 max, VE/VCO₂ slope, dan VO_2 /HR. Analisis korelasi menunjukkan bahwa rasio E/e' tidak memiliki hubungan yang bermakna dengan VO_2 max, VE/VCO₂ slope, maupun VO_2 /HR.

Kesimpulan: Rasio E/e' yang mencerminkan tekanan pengisian ventrikel kiri saat istirahat tidak berkorelasi secara signifikan dengan kapasitas fungsional latihan dan efisiensi ventilasi pada pasien HFpEF. Temuan ini menunjukkan bahwa rasio E/e' belum sepenuhnya merepresentasikan gangguan fungsional selama aktivitas fisik, sehingga CPET dapat diberikan sebagai pemeriksaan komplementer dalam evaluasi pasien HFpEF.

Kata kunci: HFpEF, rasio E/e', VO_2 max, VE/VCO₂ slope, VO_2 /HR

ABSTRACT

Introduction: Heart failure with preserved ejection fraction (HFpEF) is a cardiovascular disease with a continuously increasing prevalence and is primarily characterized by exercise intolerance as a hallmark symptom. Assessment of left ventricular filling pressure using the E/e' ratio on echocardiography is frequently employed to evaluate diastolic function; however, its ability to reflect functional capacity during physical exercise remains limited. Cardiopulmonary exercise testing (CPET) provides an integrative assessment of cardiovascular, respiratory, and metabolic responses during exercise.

Objective: This study aimed to investigate the relationship between the E/e' ratio and maximal oxygen consumption (VO_2 max), ventilatory efficiency (VE/VCO₂ slope), and oxygen pulse (VO_2 /HR) in patients with HFpEF.

Methods: This study was an analytical observational study with a cross-sectional design. The study subjects were patients with HFpEF who underwent transthoracic echocardiography and cardiopulmonary exercise testing (CPET) using an ergocycle between March and December 2025. The E/e' ratio data were obtained from medical records of transthoracic echocardiographic examinations, while VO_2 max, VE/VCO₂ slope, and VO_2 /HR data were derived from CPET assessments. Statistical analyses were performed to evaluate the relationships between the E/e' ratio and CPET parameters.

Results: The results demonstrated that patients with HFpEF exhibited reduced exercise capacity, with variability in VO_2 max, VE/VCO₂ slope, and VO_2 /HR values. Correlation analysis revealed that the E/e' ratio was not significantly associated with VO_2 max, VE/VCO₂ slope, or VO_2 /HR.

Conclusion: The E/e' ratio, which reflects left ventricular filling pressure at rest, was not significantly correlated with functional exercise capacity or ventilatory efficiency in patients with HFpEF. These findings suggest that the E/e' ratio does not fully represent functional impairment during physical activity, highlighting the role of CPET as a complementary assessment in the evaluation of patients with HFpEF.

keywords: HFpEF, E/e' ratio, VO_2 max, VE/VCO₂ slope, VO_2 /HR