

# Efek Latihan Fisik Intensitas Sedang Kontinu dan Intensitas Tinggi Interval Terhadap Kadar GLP-1, eNOS, dan Ekspresi RAGE Serta Kaitannya dengan Gambaran Histologi Aorta Tikus Hiperglikemia = The Effect of Moderate Intensity Continues and High Intensity Interval Training on GLP-1, ENOS Level and RAGE Expression and Its Association With Histological Features in Aorta of Hyperglycemic Rats

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## Abstrak

Berbagai penelitian terus dilakukan untuk mencari intervensi dalam upaya mencegah komplikasi sistem kardiovaskular yang timbul akibat kondisi hiperglikemia pada diabetes. Pada kondisi hiperglikemia, latihan fisik intensitas tinggi interval (HIIT) dan intensitas sedang kontinu (MICT) diketahui memiliki pengaruh positif, salah satunya melalui peningkatan kadar GLP-1. GLP-1 selanjutnya meningkatkan kadar eNOS aorta dan menekan ekspresi RAGE. Keseluruhan proses tersebut memberikan proteksi pada endotel dan mencegah perubahan struktur pembuluh darah.

Penelitian ini ingin mengetahui perbedaan pengaruh HIIT dan MICT terhadap kadar GLP-1, eNOS, ekspresi RAGE pada aorta dan dampaknya pada struktur aorta. Digunakan tikus jantan wistar usia 8 minggu yang dibagi menjadi 4 kelompok (6 tikus per kelompok): kelompok kontrol tanpa intervensi latihan fisik (KN), hiperglikemia tanpa perlakuan (KHG), hiperglikemia dengan intervensi MICT (HG CT), dan hiperglikemia dengan intervensi HIIT (HG IT). Hiperglikemia diinduksi dengan injeksi streptozotocin intraperitoneal dosis tunggal (40mg/BB). Tikus dianggap memenuhi kriteria hiperglikemia jika kadar glukosa darah 72 jam pasca injeksi >200mg/dL. Intervensi latihan fisik dilakukan selama 6 minggu, dilanjutkan dekapitasi dan pengambilan jaringan aorta. Kadar GLP-1 dan eNOS diuji menggunakan metode ELISA sandwich, sementara ekspresi RAGE diuji menggunakan metode qPCR. Gambaran histologi aorta dilihat menggunakan metode pewarnaan hematoxylin-eosin. Hasil penelitian menunjukkan terdapat perbedaan nilai median kadar GLP-1 dan ekspresi RAGE antara KHG dengan HG CT dan HG IT ( $p < 0.05$ ), namun tidak terdapat perbedaan nilai median kadar eNOS antara KHG dengan HG CT dan HG IT ( $p > 0.05$ ) dan tidak terdapat perbedaan diameter serta ketebalan dinding aorta antar kelompok. Untuk seluruh parameter yang diukur, tidak ditemukan perbedaan antara HG CT dan HG IT. Dapat disimpulkan bahwa baik HIIT dan MICT memberikan efek proteksi vaskular yang sama pada kondisi hiperglikemia, melalui peningkatan GLP-1 dan inhibisi RAGE.

.....Research is continuously performed to seek interventions to prevent cardiovascular system complications in diabetes arising from hyperglycemia. In hyperglycemia, high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) are known to have a positive effect, one of which is through increasing GLP-1 levels. GLP-1 further increases aortic eNOS levels and inhibit RAGE expression. The whole process provides protection to the endothelium and prevents pathological changes in structure of the blood vessels.

The aim of this study is to analyse the effect of HIIT and MICT on GLP-1 level, eNOS level, and RAGE expression in the aorta and how these affect the structure of aorta. Wistar male rats aged 8 weeks were divided into 4 groups (6 rats per group): control group without exercise (KN), hyperglycemia without

treatment (KHG), hyperglycemia with MICT (HG CT), and hyperglycemia with HIIT (HGIT). Hyperglycemia was induced by a single dose of intraperitoneal injection of streptozotocin (40 mg/BW). Rats were considered hyperglycemia if the blood glucose level within 72 hours after injection was  $>200$  mg/dL. The exercise intervention was carried out for 6 weeks, followed by decapitation and aorta tissue collection. GLP-1 and eNOS levels were tested using the sandwich ELISA method, while RAGE expression was tested using the qPCR method. Histology of the aorta was analyzed using the hematoxylin-eosin staining method. The results showed that there was a difference in the median value of GLP-1 levels and RAGE expression between KHG and both HG CT and HG IT ( $p < 0.05$ ), but there was no difference in the median value of eNOS levels between KHG and both HG CT and HG IT ( $p > 0.05$ ). There was no difference in aorta diameter and wall thickness within groups. For all parameters measured, no difference was found between HG CT and HG IT. It can be concluded that both HIIT and MICT exert similar vascular protective effects in hyperglycemic conditions, through increased GLP-1 and RAGE inhibition.