

ABSTRAK

**Mekanisme Gangguan Remodeling Tulang
akibat Latihan Fisik Intensitas Tinggi
melalui Perubahan Kadar Glukokortikoid, Osteoprotegerin,
Osteokalsin, C-telopeptide dan Jumlah Osteoblas Apoptotik**

Gadis Meinar Sari

Tujuan penelitian ini adalah menjelaskan mekanisme gangguan remodeling tulang akibat latihan fisik intensitas tinggi melalui perubahan kadar glukokortikoid, osteoprotegerin, osteokalsin, c-telopeptide dan jumlah osteoblas apoptotik

Penelitian menggunakan tikus (*Rattus norvegicus* strain Wistar) betina umur kurang lebih 3 bulan sebanyak 20 ekor yang dibagi dalam dua kelompok, yaitu kelompok kontrol dan perlakuan. Pada kelompok perlakuan diberikan latihan fisik intensitas tinggi berupa latihan renang dengan pembebanan 18% berat badan dalam waktu 90% dari waktu maksimumnya, dilakukan 2 kali per set dengan frekuensi 3 kali per minggu, selama 8 minggu. Pada akhir perlakuan diperiksa kadar glukokortikoid, osteoprotegerin, osteokalsin, c-telopeptide dan dihitung jumlah osteoblas apoptotik. Data yang diperoleh dianalisis dengan uji *t* – 2 sampel bebas (*independent t-test*) dan analisis jalur.

Hasil penelitian menunjukkan ada perbedaan kadar glukokortikoid, osteoprotegerin, osteokalsin dan c-telopeptide antara kelompok kontrol dan perlakuan ($\alpha=0,05$). Tidak terdapat perbedaan jumlah osteoblas apoptotik antara kelompok kontrol dan kelompok perlakuan. Hasil analisis jalur menunjukkan ada pengaruh latihan fisik intensitas tinggi terhadap kadar glukokortikoid ($r=0,793$); kadar glukokortikoid berpengaruh pada kadar osteoprotegerin ($r=-0,688$) dan osteokalsin ($\beta=-0,486$) tetapi tidak berpengaruh pada jumlah osteoblas apoptotik ($r=0,212$); kadar osteoprotegerin berpengaruh pada kadar c-telopeptide ($\beta=-0,658$); jumlah osteoblas apoptotik tidak berpengaruh pada kadar osteokalsin ($\beta=-0,191$); kadar c-telopeptide ($\beta=0,825$) dan osteokalsin ($\beta=-0,225$) berpengaruh terhadap rasio c-telopeptide/osteokalsin.

Kesimpulan yang diperoleh pada penelitian ini adalah latihan fisik intensitas tinggi meningkatkan kadar glukokortikoid dan c-telopeptide; menurunkan kadar osteoprotegerin dan osteokalsin; dan meningkatkan rasio c-telopeptide/osteokalsin.

Kata kunci: Latihan fisik intensitas tinggi, glukokortikoid, osteoprotegerin, osteokalsin, c-telopeptide, osteoblas apoptotik, remodeling tulang.

ABSTRACT**The Mechanism of Bone Remodelling Disorder due to High Intensity Exercise through The Changes in Levels of Glucocorticoid, Osteoprotegerin, Osteocalcin, C-telopeptide, and The Number Of Apoptotic Osteoblasts****Gadis Meinar Sari**

The purpose of this study was to explain the mechanism of bone remodelling disorder due to high-intensity exercise through change in glucocorticoid levels of glucocorticoid, osteoprotegerin, osteocalcin, c-telopeptide and the number of apoptotic osteoblasts.

The study used 20 female rats (*Rattus norvegicus* strain Wistar) aged less than 3 months which is divided into two groups, control and treatment group. The treatment group was given high intensity swimming exercise with a load of 18% body weight within 90% of the maximum time, performed two times per set with a frequency of 3 times per week, for 8 weeks. At the end of the experiment, the levels of glucocorticoid, osteoprotegerin, osteocalcin and c-telopeptide were examined and the number of apoptotic osteoblast was calculated. Data were analyzed using t - 2 free sample test (independent t-test) and path analysis.

The results showed that there was a difference in glucocorticoid level, osteoprotegerin, osteocalcin and c-telopeptide between the control and treatment groups ($\alpha=0.05$). No difference of the number of apoptotic osteoblast between control and treatment groups. The results of path analysis showed that there was a correlation between high intensity exercise and the level of glucocorticoid ($r=0.793$); glucocorticoid level correlated to the level of osteoprotegerin ($r=-0.688$) and osteocalcin ($\beta=-0.486$) but had no correlation on the number of apoptotic osteoblast ($r=0.212$); osteoprotegerin level correlated to the level of c-telopeptide ($\beta=-0.658$); level of apoptotic osteoblast had no correlation on osteocalcin level ($\beta=-0.191$), c-telopeptide level ($\beta=0.825$) and osteocalcin ($\beta=-0.225$) correlation to the ratio of c-telopeptide/osteocalcin.

Conclusions obtained in this study were high-intensity exercise increased levels of glucocorticoid and c-telopeptide; lowered levels of osteoprotegerin and osteocalcin, and increased the ratio c-telopeptide/osteocalcin.

Key words: high-intensity exercise, glucocorticoid, osteoprotegerin, osteocalcin, c-telopeptide, apoptotic osteoblasts, bone remodelling.