ABSTRAK

ANALISIS POLIMORFISME GEN *MANGANESE SUPEROXIDE DISMUTASE Ala-9Val* DAN GEN *GLUTATHIONE PEROXIDASE-1 Pro198Leu* PADA PENDERITA KATARAK USIA PRODUKTIF

Nofrisuriadi

Mekanisme yang mendasari terjadinya katarak diduga adalah stres oksidatif pada lensa mata. Polimorfisme gen MnSOD dan GPx1 akan mempengaruhi aktivitas enzim MnSOD dan GPx-1. Rendahnya aktivitas enzim MnSOD dan GPx-1 ini akan meningkatkan risiko terjadinya katarak. Penelitian ini bertujuan menganalisis hubungan antara polimorfisme gen MnSOD Ala-9Val dan GPx-1 Pro198Lue dengan kajadian katarak pada usia produktif.

Penelitian dilakukan pada 45 orang penderita katarak di kedua mata yang berusia 40-54 tahun dan 45 orang sehat yang tidak menderita katarak sebagai kontrol dengan usia yang sama. Subyek penelitian tidak mengkonsumsi vitamin, steroid, tidak merokok dan tidak menderita penyakit sistemik. Penelitian dilakukan di poliklinik mata RSUD Arifin Achmad dan RS swasta di Pekanbaru. DNA genomik diisolasi dari darah perifer. Genotipe MnSOD Ala-9Val dan GPx1 Pro198Lue diperiksa dengan metode RFLP-PCR (*polymerase chain reaction and restriction fragment length polymorphism*). Aktivitas enzim MnSOD dan GPx-1 diperiksa dari serum dengan metode *Sandwich* ELISA. Frekuensi Genotipe dan aktivitas enzim MnSOD dan GPx-1 tersebut dibandingkan antara kelompok katarak dan kelompok kontrol.

Dari hasil penelitian didapatkan frekuensi Genotipe MnSOD Ala-9Val yang mengalami mutasi, yaitu Genotipe Ala/Val and Val/Val lebih banyak pada penderita katarak usia produktif dibandingkan kelompok kontrol. Genotipe MnSOD *wild type* (Ala/Ala) lebih sedikit pada penderita katarak dibandingkan kelompok kontrol. Akan tetapi perbedaan tersebut tidak bermakna secara statistik. Frekuensi Genotipe GPx-1Pro198Leu yang mengalami mutasi (Pro/Leu dan Leu/Leu) lebih banyak pada penderita katarak usia produktif dibandingkan kelompok kontrol ($p > 0,05$). Genotipe GPx-1 *wild type* (Pro/Pro) lebih sedikit pada penderita katarak dibandingkan kelompok kontrol. Akan tetapi perbedaan tersebut tidak bermakna secara statistik ($p > 0,05$). Aktivitas enzim MnSOD dan GPx-1 berbeda bermakna ($p < 0,05$), lebih rendah pada penderita katarak dibandingkan kelompok kontrol.

Aktivitas enzim MnSOD dan GPx-1 pada penderita katarak lebih rendah dibandingkan kelompok kontrol, tetapi tidak ada perbedaan distribusi frekuensi genotipe MnSOD Ala-9Val dan GPx-1Pro198Leu yang bermakna antara kelompok kasus katarak dan kelompok kontrol. Hal ini dapat disebabkan oleh kemungkinan adanya polimorfisme MnSOD dan GPx-1 fungsional lainnya yang mempengaruhi aktivitas enzim MnSOD dan GPx-1.

Dari hasil penelitian ini dapat disimpulkan bahwa tidak ada perbedaan distribusi genotipe MnSOD Ala-9Val dan GPx-1Pro198Leu yang bermakna antara penderita katarak usia produktif dengan yang tidak menderita katarak. Aktivitas enzim MnSOD dan GPx-1 pada penderita katarak lebih rendah

dibandingkan kelompok kontrol. Disarankan penelitian lebih lanjut dengan memeriksa polimorfisme MnSOD dan GPx-1fungsional yang lain.

Kata kunci: Katarak usia produktif, Polimorfisme gen, *Manganese Superoxide Dismutase*, Glutation Peroksidase.

ABSTRACT

ANALYSIS OF MANGANESE SUPEROXIDE DISMUTASE Ala-9Val AND GLUTATHIONE PEROXIDASE-1 GENE POLYMORPHISMS IN WORKING-AGE ADULT CATARACT

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Oxidative mechanisms may play a major role in cataract formation. Manganese superoxide dismutase (MnSOD) and glutathione peroxidase1 (GPx-1) protect against oxidative damage promoted by high levels of reactive oxygen species (ROS). Functional polymorphisms in genes encoding antioxidant enzymes may result in reduced enzyme activity and alter ROS detoxification. The aim of this study was to investigate the relationship between polymorphisms of MnSOD Ala-9Val and GPx-1 Pro198Leu genes and working-age adults cataract in Indonesia population.

This was a cross-sectional study which analyzes correlation between polymorphisms of MnSOD Ala-9Val and GPx-1 Pro198Leu genes and working-age adults cataract in ophthalmology Clinic of Arifin Achmad Regional General Hospital. The study group consisted of 45 patients with cataract in working-age adults (40-54 years old) and 45 healthy control group of similar age. Genomic DNA was extracted from whole blood which were obtained from all patients and control subjects. Genotyping of MnSOD Ala-9Val and GPx-1 Pro198Leu was done by polymerase chain reaction and restriction fragment length polymorphism (PCR-RFLP) method. Spectrophotometery was employed for the estimation of MnSOD and GPx-1 activity in the serum. No antioxidant medicines and steroid were used by the cataract patients and control group enrolled in this study; otherwise, they were all healthy individuals without any systemic diseases. Genotype frequencies and enzyme activity were compared between cataract group and control.

This study found the mean ages of the cataract patients were 48,93 ± 4,07 years and control group were 47,38 ± 3,47 years ($p > 0,05$). The mutant genotype frequency of MnSOD (Ala/Val and Val/Val) and GPx-1 (Pro/Leu and Leu/Leu) was higher in cataract patients compared to controls. Wild type genotype frequency of MnSOD (Ala/Ala) and GPx-1 (Pro/Pro) was higher in control group compared to cataract patients. However, the differences were not statistically significant ($p > 0,05$). Plasma MnSOD and GPx-1 activity was significantly decreased in cataract patients compared to controls ($p = 0,00$). Plasma MnSOD activity was 508,61 ± 176,62 mU/ml in cataract patients and 1093,09 ± 292,51 mU/ml in controls, GPx-1 activity was 64,23 ± 38,07 mU/ml in cataract patients and 100,52 ± 35,74 mU/ml in controls.

Plasma MnSOD and GPx-1 activities were significantly lower in cataract patients compared to controls, but genotype frequency of MnSOD Ala-9Val and GPx-1 Pro198Leu were not significantly differnce between those two groups. The explanations for these result is may have any exposure and interaction of other genes participating in antioxidant recognition.

In conclusion, the genotype frequency of MnSOD Ala-9Val and GPx-1 Pro198Leu not significantly differnce between the working-age adults cataract patients and controls. Plasma MnSOD and GPx-1 activity was significantly decreased in cataract patients compared to controls. Further studies are needed to include other functional polymorphisms of MnSOD and GPx-1 will be able to clarify the association clearly.
Key words: Working-age adults cataract, Oxidative stress, Genetic polymorphism, Manganese superoxide dismutase, Glutathione peroxidase.