DISERTASI

HUBUNGAN GEN APOLIPROTEIN ALEL E4 rs429358 dan rs7412, KADAR *GLIAL FIBRILLARY ACIDIC PROTEIN, NEURON SPECIFIC ENOLASE,* DAN *PHOSPHORYLATED NEUROFILAMENT HEAVY CHAIN* SERUM DENGAN *OUTCOME* CEDERA OTAK TRAUMATIK

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ABSTRAK

HUBUNGAN GEN APOLIPROTEIN ALEL E4 rs429358 dan rs7412, KADAR *GLIAL FIBRILLARY ACIDIC PROTEIN, NEURON SPECIFIC ENOLASE,* DAN *PHOSPHORYLATED NEUROFILAMENT HEAVY CHAIN* SERUM DENGAN *OUTCOME* CEDERA OTAK TRAUMATIK

Dian Ayu Hamama Pitra, Yuliarni Syafrita, Rika Susanti, Rauza Sukma Rita

Latar Belakang: Cedera otak traumatik merupakan salah satu penyebab utama kematian dan disabilitas jangka panjang, dengan dampak signifikan terhadap kualitas hidup pasien dan beban layanan kesehatan. Identifikasi faktor prediktor outcome sangat penting untuk pengambilan keputusan klinis, perencanaan rehabilitasi, dan komunikasi prognosis. Faktor genetik seperti *Apolipoprotein E4* (APOE4) dan biomarker serum—*Glial Fibrillary Acidic Protein* (GFAP) sebagai penanda kerusakan glial, *Neuron Specific Enolase* (NSE) sebagai penanda kerusakan neuron, serta *phosphorylated neurofilament heavy chain* (pNFH) sebagai penanda kerusakan aksonal—telah diteliti di berbagai negara, namun hasilnya masih bervariasi. Penelitian ini merupakan studi pertama di Sumatera Barat yang menilai peran gen APOE4 bersama biomarker glial, neuronal, dan aksonal dalam memprediksi outcome cedera otak traumatik.

Metode: Penelitian ini melibatkan 99 pasien cedera otak traumatik yang memenuhi kriteria inklusi. Sampel darah diperiksa untuk gen APOE4 varian rs429358 dan rs7412, serta kadar serum GFAP, NSE, dan pNFH menggunakan metode ELISA. Outcome klinis dievaluasi tiga bulan pasca-cedera menggunakan *Glasgow Outcome Scale* (GOS). Analisis dilakukan dengan uji diagnostik dan uji bivariat untuk menilai hubungan biomarker dengan outcome.

Hasil: Sebanyak 89 pasien (89,9%) memiliki outcome baik dan 10 pasien (10,1%) memiliki outcome buruk. Analisis berdasarkan nilai *cut-off point* menunjukkan bahwa gen APOE4 rs429358 dan rs7412, serta kadar serum GFAP, NSE, dan pNFH tidak memiliki hubungan signifikan dengan outcome cedera otak traumatik ($p > 0,05$).

Kesimpulan: Penelitian ini menunjukkan bahwa gen APOE4 rs429358 dan rs7412, serta biomarker GFAP, NSE, dan pNFH, tidak berhubungan secara signifikan dengan outcome tiga bulan pasca cedera otak traumatik.

Kata kunci: cedera otak traumatik, APOE, GFAP, GOS, NSE, pNFH

ABSTRACT

THE ASSOCIATION OF APOLIPOPROTEIN E4 RS429358 AND RS7412 GENOTYPES, GLIAL FIBRILLARY ACIDIC PROTEIN, NEURON-SPECIFIC ENOLASE, AND PHOSPHORYLATED NEUROFILAMENT HEAVY CHAIN SERUM LEVELS WITH TRAUMATIC BRAIN INJURY OUTCOMES

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Background: Traumatic brain injury (TBI) is a major cause of mortality and long-term disability, with significant impact on patients' quality of life and healthcare burden. Identifying prognostic factors is crucial for guiding clinical decision-making, rehabilitation planning, and prognosis communication. Genetic factors such as Apolipoprotein E4 (APOE4), and serum biomarkers including Glial Fibrillary Acidic Protein (GFAP) as a marker of glial injury, Neuron Specific Enolase (NSE) as a marker of neuronal injury, and phosphorylated neurofilament heavy chain (pNFH) as a marker of axonal injury, have been investigated in various populations with inconsistent results. This study is the first in West Sumatra to evaluate the role of APOE4 gene variants together with glial, neuronal, and axonal biomarkers in predicting TBI outcomes.

Methods: Ninety-nine TBI patients who met the inclusion criteria were enrolled. Blood samples were collected to assess APOE4 gene variants rs429358 and rs7412, and to measure serum levels of GFAP, NSE, and pNFH using ELISA. Clinical outcomes were evaluated three months post-injury using the Glasgow Outcome Scale (GOS). Diagnostic tests and bivariate analyses were performed to examine the association between biomarkers and outcomes.

Results: Eighty-nine patients (89.9%) had a favorable outcome, and ten patients (10.1%) had an unfavorable outcome. Analysis based on cut-off points revealed no significant association between APOE4 variants rs429358 and rs7412, serum GFAP, NSE, or pNFH levels, and TBI outcomes ($p > 0.05$).

Conclusion: In this first West Sumatran study assessing genetic and multi-domain biomarkers in TBI, APOE4 variants rs429358 and rs7412, GFAP, NSE, and pNFH were not significantly associated with three-month post-injury outcomes.

Keywords: traumatic brain injury, APOE4, GFAP, GOS, NSE, pNFH