

HUBUNGAN ANTARA KADAR FERITIN DENGAN KADAR GPX4 DAN ACSL4 PADA PASIEN *TRANSFUSION DEPENDENT THALASSEMIA*

ABSTRAK

Latar Belakang: *Transfusion-dependent thalassemia* (TDT) mengalami *iron overload* kronik akibat transfusi berulang dan peningkatan absorpsi besi, yang memicu stres oksidatif dan ferroptosis melalui gangguan keseimbangan antara sistem antioksidan (GPX4) dan enzim pemicu peroksidasi lipid (ACSL4). Penelitian ini bertujuan untuk mengetahui hubungan kadar feritin dengan kadar GPX4 dan ACSL4 pada pasien TDT dewasa.

Metode: Penelitian belah lintang dilakukan pada 73 pasien TDT dewasa di RS Dr. Kariadi Semarang periode September–November 2025 yang telah mendapatkan transfusi >20 kali. Kadar feritin diperiksa dengan metode *Chemiluminescence Immunoassay* (CLIA), sedangkan GPX4 dan ACSL4 diperiksa dengan metode *Enzyme-linked immunosorbent assay* (ELISA). Analisis statistik menggunakan uji korelasi Spearman ($p < 0,05$).

Hasil: Seluruh subjek mengalami *iron overload* berat dengan median feritin 2.111,8 (1.028,7–10.270,6) ng/mL. Median kadar GPX4 12,57 (5,91–18,20) ng/mL dan median ACSL4 333,2 (6,3–1.131,0) ng/mL. Terdapat korelasi negatif lemah antara feritin dan GPX4 ($r = -0,346$; $p = 0,003$) serta korelasi positif sedang antara feritin dan ACSL4 ($r = 0,441$; $p < 0,001$).

Kesimpulan: Kadar feritin berhubungan signifikan dengan kadar GPX4 dan ACSL4 pada pasien TDT. Semakin tinggi kadar feritin, maka semakin rendah kadar GPX4 dan semakin tinggi kadar ACSL4.

Kata kunci: *transfusion-dependent thalassemia*, feritin, GPX4, ACSL4, *iron overload*, ferroptosis.

THE CORRELATION BETWEEN FERRITIN LEVELS AND GPX4 AND ACSL4 LEVELS IN TRANSFUSION-DEPENDENT THALASSEMIA PATIENTS

ABSTRACT

Background: Transfusion-dependent thalassaemia (TDT) presents with chronic iron overload due to repeated transfusions and increased iron absorption, which triggers oxidative stress and ferroptosis through an imbalance between the antioxidant system (GPX4) and the enzyme that triggers lipid peroxidation (ACSL4). This study aims to determine the relationship between ferritin levels and GPX4 and ACSL4 levels in adult TDT patients.

Method: A cross-sectional study was conducted on 73 adult TDT patients at Dr. Kariadi Hospital Semarang between September and November 2025 who had received more than 20 transfusions. Ferritin levels were measured using the Chemiluminescence Immunoassay (CLIA) method, while GPX4 and ACSL4 were measured using the Enzyme-linked immunosorbent assay (ELISA) method. Statistical analysis was done using the Spearman correlation test ($p < 0.05$).

Results: All subjects had severe iron overload with a median ferritin level of 2,111.8 (1,028.7–10,270.6) ng/mL. The median GPX4 level was 12.57 (5.91–18.20) ng/mL and ACSL4 level was 333.2 (6.3–1,131.0) ng/mL. There was a weak negative correlation between ferritin and GPX4 ($r = -0.346$; $p = 0.003$) and a moderate positive correlation between ferritin and ACSL4 ($r = 0.426$; $p < 0.001$).

Conclusion: Ferritin levels are significantly related to GPX4 and ACSL4 levels in TDT patients. The higher the ferritin levels, the lower the GPX4 levels and the higher the ACSL4 levels.

Keywords: transfusion-dependent thalassaemia, ferritin, GPX4, ACSL4, iron overload, ferroptosis