

Perbedaan Rasio Feritin/Prokalsitonin Sebagai Biomarker Diagnostik Sepsis Bakteri Dan Virus Pada Anak Sakit Kritis

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Intisari

Latar Belakang: Sepsis merupakan penyebab utama morbiditas dan mortalitas pada anak. Tingginya angka kultur darah negatif sering menghambat identifikasi etiologi infeksi, sehingga perlu biomarker diagnostik dalam membantu deteksi dini etiologi sepsis pada anak. Feritin meningkat pada infeksi bakteri maupun virus sebagai reaksi inflamasi akut, sedangkan prokalsitonin lebih spesifik meningkat pada infeksi bakteri. Oleh karena itu, rasio ferritin/prokalsitonin (F/P) berpotensi menjadi biomarker dalam membedakan etiologi sepsis pada anak sakit kritis.

Tujuan: Menilai kemampuan rasio F/P dalam membedakan sepsis bakteri dan virus pada anak sakit kritis.

Metode: Penelitian kohort prospektif dilakukan pada 85 pasien anak dengan sepsis yang dirawat di PICU RS Dr. Sardjito. Pemeriksaan kadar feritin dan prokalsitonin dilakukan menggunakan metode ECLIA. Analisis kurva ROC digunakan untuk menentukan nilai diagnostik rasio F/P.

Hasil: Sebanyak 81 pasien anak diikutsertakan dalam penelitian ini. Median rasio F/P pada kelompok sepsis bakteri adalah 40,32 (IQR 14,74–129,09), sedangkan pada kelompok sepsis virus sebesar 679,44 (IQR 236,97–1978,89). Perbedaan rasio F/P antara kedua kelompok bermakna secara statistik ($p < 0,001$). Analisis ROC menunjukkan nilai area under the curve (AUC) sebesar 0,823. Titik potong rasio F/P $\geq 163,2$ memberikan sensitivitas 79,31%, spesifisitas 78,85%, nilai ramal negatif 87,23%, dan nilai ramal positif 67,65%.

Kesimpulan: Rasio F/P memiliki kemampuan diagnostik yang baik dalam membedakan sepsis bakteri dan virus pada anak sakit kritis. Biomarker ini berpotensi digunakan sebagai parameter pendukung dalam praktik klinis, terutama pada kasus dengan hasil kultur darah negatif.

Kata Kunci: Sepsis, Feritin, Prokalsitonin, Rasio F/P, Biomarker diagnostik

Ferritin-To-Procalcitonin Ratio As A Diagnostic Biomarker To Differentiate Bacterial And Viral Sepsis In Critically Ill Children

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Abstract

Background: Sepsis remains one of the leading causes of morbidity and mortality among critically ill children. Differentiating bacterial and viral etiologies is challenging, particularly when blood culture results are delayed or negative. Ferritin and procalcitonin are commonly used acute phase reactants, and the ferritin-to-procalcitonin (F/P) ratio has emerged as a potential diagnostic parameter. However, evidence in pediatric critical care settings remains limited.

Objective: To determine the difference in the F/P ratio between bacterial sepsis and viral sepsis in critically ill children

Methods: A prospective cohort study was conducted among children aged 1 month to 18 years who met the Phoenix sepsis score criteria and were admitted to the PICU of Dr. Sardjito Hospital, Yogyakarta, between August and November 2025. Bacterial sepsis was defined by a positive blood culture or an NLR ≥ 4.67 , whereas viral sepsis was defined by a positive PCR or serology with a negative culture. Ferritin and procalcitonin levels were measured using ECLIA, and the F/P ratio was subsequently calculated. Group differences were analyzed using the Mann-Whitney U test. Diagnostic performance was evaluated using receiver operating characteristic (ROC) curves.

Results: A total of 81 patients were included in this study. The ferritin-to-procalcitonin (F/P) ratio was significantly higher in viral sepsis than in bacterial sepsis. Procalcitonin was higher in bacterial cases (10.7 vs 0.98 ng/mL; $p=0.001$), while ferritin was elevated in viral cases (1179.7 vs 373.4 ng/mL; $p=0.003$). The F/P ratio demonstrated good discriminatory performance (AUC 0.823, 95% CI 0.72-0.93), with cut-off ≥ 163.2 yielding sensitivity 79.31%, specificity 78.85%, accuracy 79.01%, PPV 67.65%, and NPV 87.23%.

Conclusion: The ferritin-to-procalcitonin (F/P) ratio serves as a robust diagnostic biomarker for distinguishing bacterial (low ratio) from viral (high ratio) sepsis in critically ill children. This simple, rapid parameter supports early etiologic identification and rational antibiotic stewardship, especially in resource-limited PICUs awaiting culture results. Multicenter validation is recommended to confirm cut-off values and enhance clinical applicability

Keywords: sepsis; ferritin; procalcitonin; F/P ratio ; Diagnostic Biomarker