Scopus

## Documents

Ramly, N.F., Wah, L.K., Nanyan, S., Ghani, M.R.A., Rashid, I.A.

**Combination of interleukin-6 and C-reactive protein levels as predictive biomarkers for early diagnosis of community-acquired pneumonia in ICU patients**

(2025) *Anaesthesia, Pain and Intensive Care*, 29 (2), pp. 254-260.

**DOI:** 10.35975/apic.v29i2.2713

Department of Anesthesiology and Intensive Care, International Islamic University Malaysia, Pahang, Kuantan, Malaysia

**Abstract**
Background & objective: Pneumonia is a leading cause of morbidity and mortality globally, accounting for 15.2% of deaths in Malaysia in 2023. Community-acquired pneumonia (CAP) poses diagnostic challenges due to the non-specificity of clinical presentations and inconsistencies in imaging interpretation. This study evaluates the diagnostic utility of biomarker interleukin-6 (IL-6), C-reactive protein (CRP) and procalcitonin (PCT), individually and in combination, to improve the diagnosis of CAP in critically ill patients. Methodology: This prospective cohort study was conducted in an intensive care unit. Adult patients admitted with dyspnea and respiratory failure were recruited, with 33 patients classified as CAP by standardized definition, and 42 as non-CAP. Biomarker levels were assessed in both groups, and diagnostic performance was evaluated with optimum cutoff levels. Results: Individually, IL-6, CRP and PCT showed poor diagnostic accuracy (AUC < 0.7). The IL-6 and CRP combination achieved the highest AUC (0.759, sensitivity 78%, specificity 67%). The IL-6 and PCT combination provided the highest sensitivity (91%) and negative predictive value (85%), aiding in ruling out CAP. Conclusion: Combined biomarker evaluation enhances diagnostic accuracy for community-acquired pneumonia, providing a basis for early treatment. These findings warrant further multicenter validation to confirm their clinical applicability in community-acquired pneumonia diagnosis. Abbreviations: CAP: community-acquired pneumonia, CRP: C-reactive protein, IL-6: interleukin-6, PCT: procalcitonin, ICU: intensive care unit 

**Author Keywords**
Biomarker; C-Reactive Protein; Community-Acquired Pneumonia; Dyspmea; Interleukin-6; Procalcitonin; Respiratory Failure

**Index Keywords**
biological marker, C reactive protein, interleukin 6, procalcitonin; adult, aged, Article, clinical trial, cohort analysis, community acquired pneumonia, controlled study, critically ill patient, diagnostic accuracy, diagnostic test accuracy study, diagnostic value, disease classification, dyspnea, early diagnosis, female, hospital admission, human, intensive care unit, major clinical study, male, middle aged, prediction, predictive value, prospective study, protein blood level, receiver operating characteristic, respiratory failure, sensitivity and specificity, standardization, Youden index

**Chemicals/CAS**
C reactive protein, 9007-41-4; procalcitonin, 56645-65-9

**References**

- Jones, BE, Chapman, AB, Ying, J, Rutter, ED, Nevers, MR, Baker, A
  **Diagnostic discordance, uncertainty, and treatment ambiguity in community-acquired pneumonia**
  (2024) *Ann Intern Med*, 177 (9), pp. 1179-1189.
  [PubMed]

- Ito, A, Ishida, T.
  **Diagnostic markers for community-acquired pneumonia**
  (2020) *Ann Transl Med*, 8 (9), p. 609.
  [PubMed]

- Htun, TP, Sun, Y, Chua, HL, Pang, J.
  **Clinical features for diagnosis of pneumonia among adults in primary care setting: a systematic and meta-review**
  (2019) *Sci Rep*, 9 (1), pp. 1-10.
  [PubMed]

- Metlay, JP, Waterer, GW, Long, AC, Anzueto, A, Brozek, J, Crothers, K
  **Diagnosis and treatment of adults with community-acquired pneumonia: an official clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America**
  (2019) *Am J Respir Crit Care Med*, 200 (7), pp. e45-e67.
  [PubMed]

- Lim, WS, Baudouin, SV, George, RC, Hill, AT, Jamieson, C, Le Jeune, I
  **BTS guidelines for the management of community-acquired pneumonia in adults: update 2009**
  (2009) *Thorax*, 64, pp. iii1-ii55.
  (Suppl 3): [PubMed]

- Makhnevich, A, Sinvani, L, Cohen, SL, Feldhamer, KH, Zhang, M, Lesser, ML
  **The clinical utility of chest radiography for identifying pneumonia: accounting for diagnostic uncertainty in radiology reports**
  (2019) *Am J Roentgenol*, 213 (6), pp. 1207-1212.
  [PubMed]

- Loubet, P, Tubiana, S, Claessens, YE, Epelboin, L, Ficko, C, Le Bel, J
  **Community-acquired pneumonia in the emergency department: an algorithm to facilitate diagnosis and guide chest CT scan indication**
  (2020) *Clin Microbiol Infect*, 26 (3).
  382.e1-7. [PubMed]

- Hunold, KM, Mion, LC, Gure, TR, Schwaderer, AL, Exline, M, Hebert, C
  **Clinical performance of existing diagnostic criteria for pneumonia in older emergency patients: a prospective cohort study**
  (2024) *J Am Geriatr Soc*, 72 (10), pp. 3068-3077.
  [PubMed]

- Walaa, M, Mansour, W, Lakouz, KA, Hussein, MM.
  **Role of chest ultrasonography in the diagnosis and follow-up of community-acquired pneumonia at Zagazig University Hospitals**
  (2017) *Egypt J Bronchol*, 11 (1), pp. 29-35.

- Shi, C, Xu, X, Xu, Y.
  **Systematic review and meta-analysis of the accuracy of lung ultrasound and chest radiography in diagnosing community-acquired pneumonia in children**
  (2024) *Pediatr Pulmonol*, 59 (9), pp. 3130-3147.
  [PubMed]

- Largman-Chalamish, M, Wasserman, A, Silberman, A, Levinson, T, Ritter, O, Berliner, S
  **Differentiating between bacterial and viral infections by estimated CRP velocity**
  (2022) *PLoS One*, 17 (12), p. e0277401.
  [PubMed]

- Bruehlman, R.
  **CRP for CAP, a new diagnostic approach?**
  (2021) *Evid Based Pract*, 24, p. 4.

- Liu, C, Zhang, Y, Shang, Y, Fang, C, He, Q, Xie, L.
  **Clinical values of common biomarkers for efficacy monitoring of antibiotics in early-onset neonatal sepsis**
  (2020) *Transl Pediatr*, 9 (5), p. 669.
  [PubMed]

- Travlos, A, Bakakos, A, Vlachos, KF, Rovina, N, Koulouris, N, Bakakos, P.
  **C-reactive protein as a predictor of survival and length of hospital stay in community-acquired pneumonia**

(2022) *J Pers Med*, 12 (10), p. 1710.
[PubMed]

- Habib, A, Raza, S, Ali, U, Zubairi, AM, Salim, E.
**Diagnostic accuracy of serum procalcitonin (PCT) as an early biomarker of neonatal sepsis using blood culture as gold standard**
(2021) *J Coll Physicians Surg Pak*, 31 (4), pp. 383-387.
[PubMed]

- Zhou, YZ, Teng, XB, Han, MF, Shi, JF, Li, CX, Zhang, XH
**The value of PCT, IL-6, and CRP in the early diagnosis and evaluation of COVID-19**
(2021) *Eur Rev Med Pharmacol Sci*, 25 (2), pp. 1097-1100.
Jan; [PubMed]

- Ratageri, VH, Panigatti, P, Mukherjee, A, Das, RR, Goyal, JP, Bhat, JI
**Role of procalcitonin in diagnosis of community-acquired pneumonia in children**
(2022) *BMC Pediatr*, 22 (1), pp. 1-7.
[PubMed]

- Henning, DJ, Hall, MK, Watsjold, B, Bhatraju, PK, Kosamo, S, Shapiro, NI
**Interleukin-6 improves infection identification when added to physician judgment during evaluation of potentially septic patients**
(2020) *Am J Emerg Med*, 38 (5), pp. 947-952.
[PubMed]

- Santa Cruz, A, Mendes-Frias, A, Oliveira, AI, Dias, L, Matos, AR, Carvalho, A
**Interleukin-6 is a biomarker for the development of fatal severe acute respiratory syndrome coronavirus 2 pneumonia**
(2021) *Front Immunol*, 12, p. 613422.
[PubMed]

- Song, J, Park, DW, Moon, S, Cho, HJ, Park, JH, Seok, H
**Diagnostic and prognostic value of interleukin-6, pentraxin 3, and procalcitonin levels among sepsis and septic shock patients: a prospective controlled study according to the Sepsis-3 definitions**
(2019) *BMC Infect Dis*, 19 (1), p. 968.
[PubMed]

- Jerome, E, McPhail, M, Menon, K.
**Diagnostic accuracy of procalcitonin and interleukin-6 for postoperative infection in major gastrointestinal surgery: a systematic review and meta-analysis**
(2022) *Ann R Coll Surg Engl*, 104 (8), pp. 561-570.
[PubMed]

- Guirao, JJ, Cabrera, CM, Jiménez, N, Rincón, L, Urra, JM.
**High serum IL-6 values increase the risk of mortality and the severity of pneumonia in patients diagnosed with COVID-19**
(2020) *Mol Immunol*, 128, pp. 64-68.
[PubMed]

- Chen, W, Zhong, K, Guan, Y, Zhang, HT, Zhang, H, Pan, T
**Evaluation of the significance of interleukin-6 in the diagnosis of postoperative pneumonia: a prospective study**
(2022) *BMC Cardiovasc Disord*, 22 (1), pp. 1-7.
[PubMed]

- Khattab, AA, El-Mekkawy, MS, Shehata, AM, Whdan, NA.
**Clinical study of serum interleukin-6 in children with community-acquired pneumonia**
(2018) *Egypt Pediatr Assoc Gaz*, 66 (2), pp. 43-48.

- Liu, F, Li, L, Xu, M, Wu, J, Luo, D, Zhu, Y
  **Prognostic value of interleukin-6, C-reactive protein, and procalcitonin in patients with COVID-19**
  (2020) *J Clin Virol*, 127, p. 104370.
  [PubMed]


**Correspondence Address**
Ramly N.F.; Department of Anesthesiology and Intensive Care, Pahang, Malaysia; email: nurfariza@iium.edu.my

**Publisher:** Faculty of Anaesthesia, Pain and Intensive Care, AFMS

**ISSN:** 16078322
**Language of Original Document:** English
**Abbreviated Source Title:** Anaesth. Pain Intensive Care
2-s2.0-105002865738
**Document Type:** Article
**Publication Stage:** Final
**Source:** Scopus