

C-reactive Protein: A Prognostic Indicator

C-reactive protein (CRP) is a serum acute phase reactant and a valuable inflammatory biomarker in various clinical conditions. It was first discovered by Tillett and Francis (1930) in the serum of patients with pneumonia but was isolated in 1941.^[1] CRP derives its name due to ability of the CRP to react with C-polysaccharide isolated from pneumococcal cell walls. The CRP gene is located on the first chromosome. It is an inducible protein which is secreted mainly by hepatocytes in response to inflammatory stimulus. It functions by binding to pathogens and activating the complement system of the body.^[2] It is also produced in small amount by nonhepatic cells such as neurons, atherosclerotic plaques, monocytes, kupffer cells, and lymphocytes.^[3,4]

CRP levels can be easily measured and standardized and provide similar results in fresh or stored state reflecting the stability of protein. It neither varies from person to person nor influenced by genetic makeup or gender of the patient. Thus, it is considered to be relatively stable serum protein compared with many other markers. In most healthy controls, plasma levels of CRP are usually 1 mg/L, with the normal range defined as <10 mg/L. Plasma levels increase within 4–6 h after initial tissue injury and continue to increase several hundredfold within 24–48 h. They rapidly disappear as the infection, or inflammatory process resolves.^[5]

CRP is a useful indicator to assess and monitor the presence, severity, and course of the inflammatory response in infectious and noninfectious disorders including acute myocardial infarction, angina, malignancies, rheumatoid arthritis, inflammatory bowel disease, burns, trauma, and after surgical procedures.^[6–8] It also serves as a prognostic indicator in a variety of clinical conditions such as acute coronary syndrome (ACS). In this condition, elevation of CRP levels is related to increased risk of myocardial infarction. Nowadays, high-sensitivity CRP is being increasingly used as a tool for cardiac risk evaluation and as a prognostic factor in ACS.^[9] It measures CRP exactly the same as the conventional test but is capable of detecting much lower CRP concentrations (detection limit of 0.03 mg/L). CRP is a strong predictor for adverse long-term events in patients with type B acute aortic dissection. Higher are the CRP values, and worse is the prognosis and outcome of the disease.^[9] CRP also appears valuable in predicting the clinical outcome and prognosis of many solid tumors such as lung, pancreas, hepatocellular, and urological cancers.^[10] High levels of CRP predict poor prognosis in patients with these tumors. It may also help predict tumor recurrence and treatment response. The CRP also

has a role in predicting the risk of rebleeding in patients with acute nonvariceal upper gastrointestinal bleeding.^[11] CRP is considered to be a strong predictor of prognosis in chronic obstructive pulmonary disease. High level of serum CRP is associated with an increased risk of mortality in these patients.^[12] Elevated CRP levels at ICU discharge also have a poor prognosis. These high levels are associated with readmission and in-hospital mortality.^[13] Although CRP is a valuable marker to predict prognosis and other important clinical outcomes in many diseases, better designed large-scale studies on the role of CRP as a prognostic indicator are needed to confirm these observations.

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References

1. Tillett WS, Francis T. Serological reactions in pneumonia with a non-protein somatic fraction of pneumococcus. *J Exp Med* 1930;52:561-71.
2. Chandrashekara S. C-reactive protein: An inflammatory marker with specific role in physiology, pathology, and diagnosis. *Internet J Rheumatol Clin Immunol* 2014;2:1-23.
3. Pepys M. C-reactive protein: A critical update. *J Clin Invest* 2003;112:299.
4. Jialal I, Devaraj S, Venugopal SK. C-reactive protein: Risk marker or mediator in atherothrombosis? *Hypertension* 2004;44:6-11.
5. Weinberg G, Powell K. Laboratory aids for diagnosis of neonatal sepsis. In: Remington J, Klein J, editors. *Infectious Diseases of the Fetus and Newborn Infant*. 5th ed. Philadelphia, PA: Saunders; 2001. p. 1327-44.
6. Jaye DL, Waites KB. Clinical applications of C-reactive protein in pediatrics. *Pediatr Infect Dis J* 1997;16:735-46.
7. Young B, Gleeson M, Cripps AW. C-reactive protein: A critical review. *Pathology* 1991;23:118-24.
8. Reinhart K, Meisner M, Hartog C. Diagnosis of sepsis: Novel and conventional parameters. *Adv Sepsis* 2001;1:42-51.
9. Su Y. The value of C-reactive protein in emergency medicine. *J Acute Dis* 2014;3:1-5.
10. Shrotriya S, Walsh D, Bennani-Baiti N, Thomas S, Lorton C. C-reactive protein is an important biomarker for prognosis tumor recurrence and treatment response in adult solid tumors: A systematic review. *PLoS One* 2015;10:e0143080.
11. Lee HH, Park JM, Lee SW, Kang SH, Lim CH, Cho YK, *et al*. C-reactive protein as a prognostic indicator for rebleeding in

patients with nonvariceal upper gastrointestinal bleeding. Dig Liver Dis 2015;47:378-83.

12. Deng ZC, Zhao P, Cao C, Sun SF, Zhao F, Lu CY, *et al.* C-reactive protein as a prognostic marker in chronic obstructive pulmonary disease. Exp Ther Med 2014;7:443-6.
13. Gülcher SS, Bruins NA, Kingma WP, Boerma EC. Elevated C-reactive protein levels at ICU discharge as a predictor of ICU outcome: A retrospective cohort study. Ann Intensive Care 2016;6:5.

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