Evaluation of CRP in ESRD Patients

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BACKGROUND

Inflammation is the immune system's response to injury or infection. It is characterized by redness, heat, swelling, and pain. Inflammation plays a major role in the progression and complications of end-stage renal disease (ESRD), which is the final stage of chronic kidney disease. The kidneys filter waste products and excess water from your blood, which are then excreted in the urine. When the kidneys lose their filtering ability, dangerous levels of fluid, electrolytes, and waste products can build up in the body.

ESRD occurs when chronic kidney disease, the gradual loss of kidney function, progresses to an advanced stage, and the kidneys lose nearly all their ability to perform essential functions, such as filtering waste products and regulating fluid levels. At this stage, the glomerular filtration rate is less than 15 mL/min/1.73m^2. With ESRD, the patient needs dialysis or a kidney transplant to stay alive. Because inflammation significantly impacts ESRD, biomarkers such as C-reactive protein (CRP) are frequently used to assess inflammation and predict patient outcomes. CRP is an acute-phase protein produced primarily by the liver in response to inflammation, and its synthesis is stimulated by cytokines.

CLINICAL SIGNIFICANCE

- ESRD patients have elevated cardiovascular mortality
- Because of its rapid increase during inflammation and short half-life, CRP serves as a reliable and sensitive biomarker for inflammatory activity
- Elevated CRP levels can predict myocardial infarction, stroke, and vascular inflammation
- This can help improve the identification of patients who are at an increased thrombotic risk

OBJECTIVES

Our objective was to compare an inflammatory biomarker (specifically CRP) between healthy individuals and patients with ESRD, and to understand the relationship between inflammation and ESRD.

METHODS

- A comparative study was performed using two groups: ESRD (n=72) and healthy controls (n=50).
- The ESRD group consisted of patients diagnosed with end-stage renal disease (glomerular filtration rate < 15 mL/min/1.73 m^2).
- The Healthy control group was individuals with no known inflammatory or renal disorders.
- Blood samples were collected from patients and analyzed by sandwich ELISA, and CRP levels were measured in µg/mL (Figure 1).
- Comparisons between the ESRD and control groups were performed using a Mann-Whitney U test, with an alpha value of 0.05.

RESULTS

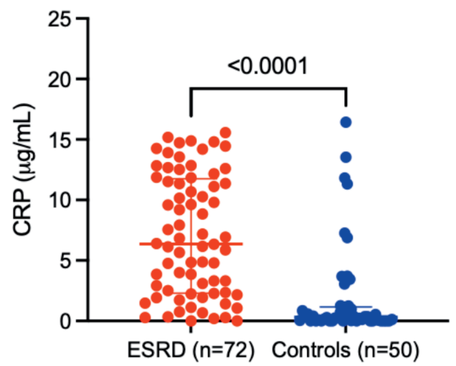

Figure 1: CRP Levels (µg/mL) in ESRD vs Control Patients

Table 1: Comparison of median and IQR values between the control group and ESRD patients for CRP levels

	Median (ng/mL)	IQR (ng/mL)
Control Group	0.317	0.0105 - 1.173
ESRD Patients	6.366	2.306-11.75

DISCUSSION

CRP levels were significantly higher in the ESRD group compared to healthy controls. The median CRP level in ESRD patients was 6.366 ng/mL, with an interquartile range (IQR) of 2.306-11.75 ng/mL, whereas the control group had a median of 0.317 ng/mL and an IQR of 0.0105-1.173 ng/mL. Statistical comparison using the Mann-Whitney U test demonstrated a highly significant difference between groups ($p < 0.0001$). Overall, ESRD patients exhibited markedly higher CRP levels, with both the median and IQR values substantially elevated compared to controls. These findings demonstrate a strong association between ESRD status and increased CRP levels within this cohort.

CONCLUSIONS

- ESRD patients have elevated CRP levels compared with healthy patients, suggesting increased inflammation and supporting CRP as a reliable biomarker for assessing inflammation in patients with ESRD.
- Elevated CRP levels in ESRD patients demonstrate the chronic inflammatory state that is associated with renal failure and can potentially suggest higher cardiovascular risks.

Future Directions

Future studies with larger sample sizes and more inflammatory markers, such as TNF-a, should be conducted to deepen the understanding of how inflammation progresses in ESRD patients and how it affects patient outcomes.

Limitations

The study is limited by a lack of control for confounding factors such as age, other medical conditions, and by the small sample size.

REFERENCES