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High sensitivity C- reactive protein a predictive marker in chronic kidney disease and cardiovascular disease

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Abstract

Background: Persistent, low-grade inflammation likely participates in the pathophysiology of both atherosclerosis and kidney disease. Although high-sensitivity C-reactive protein (hsCRP) predicts future cardio vascular risk and chronic kidney disease (CKD), it is unknown whether hsCRP levels predict adverse renal outcomes in patients with cardiovascular disease.

Methods: All inpatients with clinical and / or biochemical evidence of chronic kidney disease, admitted in hospital for CKD and cardiovascular disease patient. Patients who refuse to give consent, Critically/ terminally ill Patients, Patients with pre-existing cardiac valvular disease, HIV Positive Patients, Patients taking immune-suppressive therapy, Patients on chemotherapy, Acute kidney injury patient were excluded.

Results: This prospective observational study done in 100 patients in central India, to observe CRP level in CKD Patients and to evaluate CRP as a marker for Cardiovascular risk, From 1st January 2022 to 31st December 2022.

In this study group majority of the patients were above 40 years of age, mean age of the study was 57 years, Male: female ratio of 1.72:1. There was significant predominance for CKD in male patients in study, Patterns in the incidence of kidney disease across gender are generally consistent, with higher rates occurring in men than in women. Similarly, men are reported to have greater rates of progression of nondiabetic CKD for some specific types of kidney disease, especially compared with premenopausal women.

Conclusions: Renal insufficiency causes a prolonged acute phase inflammatory reaction that is accompanied with elevated inflammatory markers such as hsCRP, IL-6. These inflammatory markers are significantly associated with cardiovascular morbidity and mortality. Elevated hsCRP was associated with subsequent risk of AKI and progression of CKD, irrespective of baseline kidney function.

Keywords: CKD, MDA, TNF.

Introduction

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function, and a progressive decline in glomerular filtration rate (GFR). The term CRF applies to the process of continuing significant irreversible reduction in nephron number, and typically corresponds to CKD stages 3–5.

There are studies to demonstrate the role of increased levels of CRP and reactive oxygen species in ESRD and patients undergoing dialysis. The study was intended to determine the levels of high sensitivity C reactive protein (hsCRP) as a marker of inflammation in pre-dialytic renal disease patients and to decipher if there is any association between serum hsCRP and MDA levels with the progression of kidney disease. Certain immunological tests might help to make sure the level of inflammation including a variety of cytokine levels and acute phase proteins, of which c-reactive protein is very central and sensitive.

Occurrence of an inflammatory response, old age and extent of hydration could also grounds hypo albuminemia. There is a considerable association between serum albumin and CRP levels in CKD children, as CRP levels boost up there is a reduction in serum albumin, the reason for this is that as the pro-inflammatory cytokines such as IL-1, IL-6 and TNFα cause an increase in positive APRs in liver they also cause reduction in synthesis of albumin and other negative APRS. So, when the level of one is increasing in inflammation such as CKD the other goes on decreasing and vice versa.

CKD is a chronic inflammatory state caused by both patient and dialysis related factors like- uremic milieu, infection, oxidative stress, co-morbidities, obesity, genetic or immunologic factors, exposure to dialyzer membrane and dialysate in those on dialysis. Consequences of chronic inflammation in CKD patients include malnutrition, anaemia, hypo-responsiveness to erythropoietin, CVD and increased mortality. Amuk et al reported that CRP and endothelial function could provide complementary prognostic information regarding future cardiovascular disorders in renal patients. However, patients whose hsCRP levels remain elevated overtime would be expected to have greater mortality than patients with occasionally elevated levels.

Aims and objectives

- To observe CRP level in CKD Patients.
- To evaluate, CRP as a marker for Cardiovascular risk.
- From 1st January 2022 to 31st December 2022.

Inclusion criteria

- All inpatients with clinical and / or biochemical evidence of chronic kidney disease.

Exclusion criteria

- Patients who refuse to give consent.
- Critically/terminally ill Patients
- Patients with pre-existing cardiac valvular disease.
- HIV Positive Patients.
- Patients taking immune-suppressive therapy. 6) Patients on chemotherapy.
- Acute kidney injury patient.

Methodology

After taking institutional ethical clearance and written consent from the patients across sectional observational study will be conducted on patients admitted in hospital, who have clinical and / or biochemical evidence of chronic kidney disease, detailed thorough history taking, general physical examination, systemic examination and routine and specific lab investigations, will be done to find out the underlying aetiology, clinical features and 65 outcome of Chronic Kidney Disease.

Statistical analyses

All the data analysis was performed using IBM SPSS ver. 2.0 software. Frequency distribution and cross tabulation was used to prepare the tables. Quantitative variables were expressed as the mean and standard deviation. Categorical data was expressed as percentage. Categorical variables were compared by chi-square test. Mean was compared using one way ANOVA analysis. PRISM and Microsoft office was used to prepare the graphs.

Observations and results

Table 1:

Age	Male	Female	Total	P-value
21-30	11 [16.9%]	7 [20%]	18 [18%]	0.004
31-40	8 [12.3%]	4 [11.4%]	12 [12%]	
41-50	17 [26.2%]	13 [37.1%]	30 [30%]	
51-60	8 [12.3%]	10 [28.6%]	18 [18%]	
Above 60	21 [32.3%]	1 [2.9%]	22 [22%]	
Total	65 [100%]	35 [100%]	100 [100%]	

- In this study group majority of the patients were above 30 years of age. Mean age of the study was 47.8 years.
- Male: female ratio of 1.85:1. There was significant predominance for CKD in male patients in study.

Table 2:

Parameter	N	Minimum	Maximum	Mean	Std. deviation
Age	100	21	74	47.89	14.24
SBP	100	130	160	148.2	8.81
DBP	100	80	110	99	6.89
Blood urea	100	85	230	146.6	27.55

- In our study SBP and DBP was raised above reference level.
- mean SBP were 148.2±8.81 and mean DBP were 99±6.89.
- In our study SBP and DBP was raised above reference level.

The present study shows excess inflammation and oxidative stress in the CKD patients, as hsCRP were raised in 45% of patients hsCRP was raised above 5 mg/dL which is similar to the previous studies.

Renal insufficiency causes a prolonged acute phase inflammatory reaction that is accompanied with elevated inflammatory markers such as hsCRP, IL-6.

These inflammatory markers are significantly associated with cardiovascular morbidity and mortality. The

subjects in our study were anemic (Hb=7.46±0.80 gm/dL).

Discussion

The present study shows excess inflammation and oxidative stress in the CKD patients, as hsCRP were raised in 85% of patients hsCRP was raised above 3 mg/dL.

Our study enrolled 100 patients, of which 35 were females and 65 were male. Patterns in the incidence of kidney disease across gender are generally consistent, with higher rates occurring in men than in women. Similarly, men are reported to have greater rates of progression of nondiabetic CKD for some specific types of kidney disease, especially compared with premenopausal women.US Renal Data System has also reported the incidence rates for end-stage renal disease (ESRD) approximately 60% higher among men than among women. The prevalence of CKD increases with age and is reported to be as high as 56% in people aged 75 years or older.

Longitudinal studies of subjects without kidney disease have demonstrated a decline in GFR with increasing age in some but not all subjects, which implies that nephron loss may be regarded as part of normal aging. On the other hand, aging is associated with an increase in several other risk factors for CKD - including hypertension, obesity, and cardiovascular disease - that may contribute to the rise in prevalence of CKD. in our study we included patients of age between 21 to 74 years mean age is 47.

The mean hemoglobin level in our patients was 7.469 ± 0.801 mg/dL. The prevalence of anemia in patients with CKD has been widely studied. In general, anemia becomes more frequent as renal function declines, becoming almost universal in end-stage renal disease (ESRD). Astor and colleagues studied the NHANES III including 15,419 participants 20 years and older. Anemia (World Health Organization definition, Hgb 5 mg/dL. In previous studies also it was found to be raised in patients of chronic kidney disease.

EL-Attar HA et al found increase in hsCRP in patients on hemodialysis therapy when compared to both controls and patients on non-dialytic therapy.

In our study a significant association may have been missed due to sample size in the present study. Similarly, an association between the levels of oxidant stress biomarkers and cardiovascular disease may have been missed due to sample size. A weakness in the present study is its cross sectional, observational nature, as well as the relatively small sample size.

Summary & conclusion

A cross-sectional, observational study was carried out to assess the highly sensitive c-reactive protein (hsCRP) levels in chronic kidney observed. A total number of 100 patients were enrolled, fulfilling inclusion criteria. Questionnaires were administered to the study subjects by the researchers to obtain demographic information such as age, gender and clinical history such as history of renal symptoms, common etiologies such as hypertension, diabetes mellitus, retroviral disease, haemoglobinopathy, obstructive uropathy, connective tissue disease and previous or family history of renal disease. Study subjects were physically examined. Weight was measured using a weighing scale with subjects wearing light clothing.

The etiology of renal disease in CKD subjects were determined by the researchers using the information obtained from administered questionnaires, physical examination findings and investigations. Micro-vascular complications were defined as neuropathy, retinopathy and macro-vascular complications were defined as heart failure, coronary artery disease, cerebrovascular disease.

Blood sampling was performed between 8 and 10 a.m. after an overnight fasting. Laboratory parameters included CBC, kidney function tests, fasting glucose, lipid profile, and serum highly sensitive C - reactive protein. GFR was calculated by the Cockcroft Gault equation.

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