Study the relationship between hs-CRP level and urinary albumin creatinine ratio (UACR) levels

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Abstract
Background: C-reactive protein (CRP), an acute phase reactant, is a highly sensitive marker of inflammation. Its level rises dramatically during an inflammatory process. CRP has a long half life, affordability of estimation and stability of its levels with no circadian variation and therefore is one of the best markers of vascular inflammation.

Methods: Hospital based cross-sectional Study was conducted at Department of Medicine, S.P. Medical College, Bikaner on Type 2 diabetes patients reporting to OPD & IPD of Medicine Department.

Results: Mean hs-CRP in UACR group <30 µg/mg was 1.76±1.37 mg/l and in ≥30 µg/mg it was 6.12±3.36 mg/l and this difference was found statistically highly significant (p<0.001).

Conclusion: We found hs-CRP is high in microalbuminuria group compared to normoalbuminuria group. It was also found in our study that diabetic nephropathy is associated with hs-CRP level.

Keywords: C-reactive protein (CRP), Inflammation, Urinary albumin creatinine ratio (UACR).

Introduction
Diabetic nephropathy is the single most common cause of chronic renal failure, accounting for 45% of patients receiving renal replacement therapy, and is a rapidly growing problem worldwide. Recent evidence suggest that chronic subclinical inflammation may play a key role in the initiation and progression of diabetic nephropathy and finally leads to the development of glomerulosclerosis and tubulointerstitial fibrosis¹. Recent studies suggest that proinflammatory cytokines such as interleukin (IL)-1, IL-6, IL-8, and tumor necrosis factor play a role in the pathogenesis of diabetic nephropathy². C-reactive protein (CRP), an acute phase reactant, is a highly sensitive marker of inflammation. Its level rises dramatically during an inflammatory process. CRP has a long half life, affordability of estimation and stability of its levels with no circadian variation and therefore is one of the best markers of vascular inflammation¹. CRP has been found to be associated with disorders like diabetes mellitus (DM), cardiovascular disorders, metabolic syndrome, renal failure, etc³. Serum high sensitivity CRP (hs-CRP) level is higher in patients with type 2 diabetes mellitus than in normal subjects and plays an important role in the...
development and progression of type 2 diabetes mellitus.

Materials and Methods

Study Design: Hospital based cross-sectional Study

Study Place: Department of Medicine, S.P. Medical College, Bikaner

Study population: Type 2 diabetes patients reporting to OPD & IPD of Medicine Department

Sampling Method: Random Sampling

a. Inclusion criteria
i. Type 2 Diabetes Mellitus (according to WHO diagnostic criteria) patient receiving either oral hypoglycemic agents or insulin or both
ii. Willing to participate
iii. Type 2 Diabetes Mellitus patients having Normoalbuminuria or Microalbuminuria [urinary albumin creatinine ratio <300 µg/mg]

Diagnostic criteria for diabetes mellitus:
1. Fasting blood sugar > 7.0mmol/L(126mg/dl) or
2. HbA1C > 6.5%
3. Two hour plasma glucose > 11.1mmol/L (200mg/dL) during an oral glucose tolerance test

b. Exclusion criteria:
   i. Patients with type 1 diabetes mellitus.
   ii. Not willing to participate
   iii. Have suffered from any acute illness in past 1 week
   iv. Patient with macroalbuminuria (UACR >300µgm/mg)
   v. Patient with pre-existing renal disease eg polycystic kidney disease,
   vi. Type 2 DM patients having cardiovascular disease.

Observations

In present study, overall mean age in females was 57.53±8.23 and in males it was 58.95±8.23 years. Mean age of onset in females was 49.39±6.30 and in males it was 49.73±5.45 years while mean duration of diabetes in females was 8.14±4.92 years and in males it was 9.23±5.70 years and these differences were found statistically insignificant (p>0.05).

Table 1 Distribution of Cases according to UACR in relation to hs-CRP Group

| hs-CRP Group (mg/l) | UACR Group (µg/mg) | Total |
|---------------------|---------------------|-------|
|                     | <30 | ≥30 |       |       |
| No. | %    | No. | %    | No.  |
|<3 | 63 | 71.6 | 25 | 28.4 | 88 |
|3-6 | 8 | 16.0 | 42 | 84.0 | 50 |
|>6-9 | 2 | 4.9 | 39 | 95.1 | 41 |
|>9 | 0 | - | 22 | 100 | 22 |
|Total | 73 | 36.3 | 128 | 63.7 | 201 |

According to above table, out of total 201 cases, 88 patients had their hs-CRP level <3 mg/l and out of them 63(71.6%) and 25(28.4%) cases belonged to initial UACR group <30 µg/mg and ≥30 µg/mg respectively. In hs-CRP group 3-6 mg/l, total 50 patients were found and out of them 8(16%), 42(84%) patients had their initial UACR <30 and ≥30 µg/mg respectively, 41 patients had their hs-CRP level >6-9 mg/l and out of them 2(4.9%) and 39(95.1%) cases belonged to initial UACR group <30 and ≥30 µg/mg respectively while 22 patients had their hs-CRP level >9 mg/l
and they all belonged to initial UACR group $\geq 30$ µg/mg.

Mean hs-CRP in UACR group $<30$ was $1.76 \pm 1.37$ mg/l and in $\geq 30$ it was $6.12 \pm 3.36$ mg/l and this difference was found statistically highly significant ($p<0.001$).

**Discussion**

In our study, overall mean age in females was 57.53±8.23 years and in males it was 58.95±8.23 years. Mean age of onset in females was 49.39±6.30 years and in males it was 49.73±5.45 years while mean duration of diabetes in females was 8.14±4.92 years and in males it was 9.23±5.70 years and these differences were found statistically insignificant ($p>0.05$).

In present study, mean hs-CRP in UACR group $<30$ (normoalbuminuria) was $1.76 \pm 1.37$ mg/l and in $\geq 30$ (microalbuminuria) it was $6.12 \pm 3.36$ mg/l and the difference was found statistically highly significant ($p<0.001$).

Similar observed made by Navarro et al$^5$ they studied patients with type 2 diabetes and revealed that CRP levels were high in patients with microalbuminuria or mild proteinuria compared with those with normoalbuminuria. Saraheimo et al$^6$ evaluated the association between CRP levels and diabetic nephropathy in 194 patients with type 1 diabetes and found that CRP was higher in patients with micro- and macroalbuminuria compared with those without$^6$.

**Conclusion**

Recent evidence suggests that chronic subclinical inflammation may play a key role in the initiation and progression of diabetic nephropathy. C-reactive protein (CRP), an acute phase reactant, is a highly sensitive marker of inflammation. We found hs-CRP is high in microalbuminuria group compared to normoalbuminuria group. It was also found in our study that diabetic nephropathy is associated with hs-CRP level.

**Bibliography**

1. Rivero A, Mora C, Muros M, García J, Herrera H, Navarro-González JF. Pathogenic perspectives for the role of inflammation in diabetic nephropathy. Clin Sci 2009; 116(6): 479–492.

2. Hasegawa G, Nakano K, Kondo M. Role of TNF and IL-1 in the development of diabetic nephropathy. Nefrologia 1995; 15:1–4.

3. Mahajan A, Tabassum R, Chavali S, Dwivedi OP, Bharadwaj M, Tandon N, et al. High-sensitivity C-reactive protein levels and type 2 diabetes in urban North Indians. J Clin Endocrinol Metab. 2009; 94:2123–7.

4. Martha RM, Fernando GR. Increased levels of CRP in non-controlled type II diabetic subjects. J Diabetes Complications. 1999; 13:211–5.

5. Navarro JF, Mora C, Maca M, Garca J. Inflammatory parameters are independently associated with urinary albumin in type 2 diabetes mellitus. Am J Kidney Dis. 2003; 42(1):53–61.

6. Saraheimo M, Teppo AM, Forsblom C, Fagerudd J, Groop PH. Diabetic nephropathy is associated with low-grade inflammation in Type 1 diabetic patients. Diabetologia 2003;46:1402–1407.