

ORIGINAL ARTICLE

ROLE OF C-REACTIVE PROTEIN AS A MARKER FOR MICROALBUMINURIA IN TYPE 2 DIABETICS

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Background: One of the most important complications of Type 2 diabetes mellitus is diabetic nephropathy which is reported as the leading cause of premature deaths due to renal failure. This study was being conducted to see the role of C-reactive protein a marker in type 2 diabetic patient with micro-albuminuria. **Methods:** This cross sectional study was carried out in the Diabetic Clinic of Pakistan Medical Research Council, Research Centre Lahore. Personal history about the disease was collected on a questionnaire. Blood and urine sample of 50 type 2 diabetic patients between the ages of 40–65 years were collected to analyze C-reactive protein and micro-albuminuria respectively. Data were analyzed using SPSS-15. The Pearson correlation coefficient test was used to determine correlation between urine albumin and C-reactive protein. **Results:** There were 22 micro-albuminuria positive cases out of total 50 diabetic cases. Of these 14 (63%) showed raised C-reactive protein levels ($p < 0.00$). **Conclusion:** There is significant association between the level of serum C-reactive proteins and micro-albuminuria in type 2 diabetics

Keywords: CRP, Micro-albuminuria, Type 2 Diabetes

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INTRODUCTION

Diabetes mellitus is one of the common metabolic disorders which are characterized by hyperglycaemia due to insulin deficiency or insulin resistance.¹ It is affecting almost 6% of the world's population and prevalence of this chronic metabolic disease is increasing.² According to World Health Organization (WHO), 180 million people worldwide had diabetes in 2006 and this number is likely to double by 2030.³

Type 2 diabetes mellitus (T2DM) has become one of the most important chronic public health problems and is a growing cause of mortality and morbidity. One of its complications, the diabetic nephropathy (DN), is the leading cause of premature deaths in diabetic patients due to renal failure.⁴ Mortality due to kidney failure in diabetic patient is 20–40 times more than those without diabetes.⁵

An early sign of impending nephropathy is micro-albuminuria, which is defined as the urinary excretion of albumin at the rate of 30–299 mg/24 hours.^{6–7} Various studies have reported micro-albuminuria to be an independent and strong predictor of ischemic heart disease in patients with diabetes.⁸ It has been reported that there is a correlation between serum C-reactive protein (CRP) levels and micro-albuminuria in diabetic patients.⁹ It is documented that low-grade inflammation, reflected by high CRP levels, may play a role in the induction and activation of inflammatory pathways in progression of kidney and cardiovascular atherosclerotic disease.^{10,11}

This study was being conducted to see the association of micro-albuminuria with CRP in type 2 diabetic patients.

MATERIAL AND METHODS

This descriptive cross sectional study was conducted at Medical outdoor of Sir, Ganga Ram Hospital and Diabetic Clinic of PMRC Research Centre Lahore. A total of 50 patients with type-2 diabetes between 40–65 years of age visiting the clinic were consecutively selected to investigate them for microalbuminuria and CRP. Questionnaire was designed to collect the demographic information e.g., age, sex, height, weight, marital status, duration of diabetes, physical activity, and personal history.

Patient having history of severe hypertension (systolic blood pressure >160 mm Hg or diastolic blood pressure >100 mm Hg), cardiovascular disease, history of statins intake and kidney failure were excluded. Patients were divided into four groups classified according to their BMI: underweight (BMI <18 kg/m²), Normal (BMI 18–24.9 kg/m²), Overweight (BMI 25–29.9 kg/m²), Obese (BMI >30 kg/m²).

About 3 ml of blood sample and 5 ml of urine sample was collected. Serum was separated by centrifuge machine at a speed of 4000 rpm. Serum was used for analysis of CRP level and the urine sample was used for determination of micro-albuminuria. Micro-albuminuria was tested only in those patients who did not have proteinuria.

Micro-albuminuria was determined by enzyme labelled chemiluminescent competitive immunoassay using immunoanalyzer (immulite 2000) with 25 ul of urine sample. CRP was done by Latex immunoassay on Auto analyzer (Architect c8000). Cut

off values of micro-albuminuria and CRP are <20 and 0.5 mg/dl respectively.

Data were analysed using SPSS-15 Chi-square test was used to determine association between micro-albuminuria and CRP.

RESULTS

Cases of diabetes were analysed for micro-albuminuria and CRP (n=50). The mean age of diabetic patients was 51.1±8.93 years. There were 40 (80%) males and 10 (20%) females. In this study 32 (65%) of the patients had normal BMI, 12 (24%) were overweight and 6 (12%) were obese. The mean systolic blood pressure of diabetic patients was 138.40±22.67 mmHg, and mean diastolic blood pressure was 92.00±9.13 mmHg.

Of the total of 50 diabetic patients, it was seen that 22 (44%) cases were having micro-albuminuria and out of these 22, 14 (63%) showed CRP level raised above the reference values. No significant association of micro-albuminuria protein seen with duration of diabetes and BMI. There is statistically significant association between micro-albuminuria and CRP ($p<0.00$).

Table-1: Association of Microalbuminuria and CRP

Total no of cases n=50	CRP raised n (%)	CRP normal n (%)	p-value
Microalbuminuria raised n (22)	14 (63)	8 (36)	<0.00
Microalbuminuria normal n (28)	2 (7)	26 (93)	

DISCUSSION

To evaluate relationship between micro-albuminuria and elevate serum level of CRP in type 2 diabetic patients a total 50 diabetic patients were selected. In this study, 55% of the subjects had normal BMI 30% overweight and 15% obese. The mean body mass index (BMI) of diabetic was 29.00±5.51kg/m² that are they were categorized as overweight. A study showed that patients with diabetes had high BMI.¹²

The mean systolic blood pressure and diastolic blood pressure of diabetics was 138.40±22.67 mmHg and 92.00±9.13 mmHg. The diastolic blood pressure was high in these patients. One study also showed a significant association of hypertension with type 2 diabetes mellitus.¹³ This is because diabetes increases the risk of developing high blood pressure and other cardiovascular problems, as it adversely affects the arteries, predisposing them to atherosclerosis. Which can lead to blood vessel damage, stroke, heart failure, heart attack, or kidney.¹⁴

Micro-albuminuria is a strong predictor of development of diabetic nephropathy.¹⁵ It is the first clinical sign of renal dysfunction in patients with

diabetes which develops in 2–5% of patients per year.¹⁶ Although it is reversible but may lead to kidney failure if neglected. Therefore, early diagnosis may help to prevent progression of kidney disease.¹⁷

Findings by Stehouwer, C. *et al* suggested that prevention of hyper-glycaemia and other anti-inflammatory treatments may be beneficial in addressing the early progressive inflammatory response associated with diabetes and vascular disease.¹⁸

In the present study it was observed that diabetics with micro-albuminuria showed a statistically significant association with CRP level ($p<0.00$). A similar relationship ($p<0.001$) was observed by Mojahedi, *et al*.¹⁰ In another study, it was reported that CRP was associated with micro-albuminuria and decreased renal filtration.¹⁴ Previous studies have also shown that CRP levels tend to be higher in subjects with clinical diabetic nephropathy.¹⁹ CRP protein has been found to be a good marker of diabetic nephropathy.

CONCLUSION

It is concluded that there is a significant association between the level of serum CRP and micro-albuminuria in type 2 diabetics. Thus activation of inflammatory pathways in progression of kidney disease as represented by high sensitive CRP suggests that measurement of serum CRP can be useful for diagnosis of early stages of diabetic nephropathy. Further studies are needed to see the role CRP for monitoring the risk of atherosclerotic complications in patients with chronic kidney disease and end-stage renal disease, particularly in those with evidence of coronary heart disease or other cardiovascular complications.

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