

High sensitive C- reactive protein and microalbumin in type 2 diabetes mellitus

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ABSTRACT

Background: Diabetes mellitus is one of the leading causes of morbidity and mortality because of its role in the development of optic, renal, neuropathic and cardiovascular diseases (CVD). It is major public health care problem in developed countries as well as developing areas like India. **Objectives:** The aim of this study is to determine the serum high sensitive C- Reactive Protein (hs-CRP) and urinary microalbumin levels in patients with type 2 diabetes mellitus and to compare with healthy controls. **Materials and Methods:** In this study total 80 subjects were included above 40 years of age. 40 clinically diagnosed type 2 diabetic patients and 40 normal subjects were recruited as control. Microalbumin and hs-CRP were measured by latex turbidimetric method. **Statistical Analysis:** Data were analyzed using student 't' test for their level of significance. **Results:** The mean microalbumin level in type 2 diabetic patients was significantly higher than in the controls. The serum hs-CRP levels were significantly higher in patients as compared to control subjects. **Conclusion:** Increased levels of hs-CRP and microalbumin may be implicated in the development of cardiovascular disease and renal impairment and these investigations will defiantly help in the management of diabetic patients.

Keywords: CVD, hs-CRP, microalbumin, morbidity, mortality, Type 2 diabetes mellitus.

Introduction

Diabetes is now among the five leading causes of death due to disease in most countries. [1] Approximately 171 to 194 million people in the world have diabetes. This number is expected to increase to more than 300 million by the year 2025 – a doubling within a single generation. It is major public health care problem in developed countries as well as developing areas like India. [2, 3] Type 2 diabetes is a multifactorial disease and shows heterogeneity in numerous respects. [4] As the prevalence of type 2 diabetes increases, the disease is encroaching on younger and younger adults. [5] This decline in the age of onset of type 2 diabetes is an important factor influencing the future burden of the disease.

Since onset in childhood heralds many years of disease and an accumulation of the full gamut of complications. Type 2 diabetes in children and adolescents has now become a major new challenge in diabetes. [6] Type 2 diabetes frequently goes undiagnosed for many years because the hyperglycemia develops gradually and in the earlier stages is not severe enough to produce the classic symptoms of diabetes; however such patients are at increased risk of developing macrovascular and microvascular complications.[7]The manifestations include the metabolic syndrome, a cluster of cardiovascular disease (CVD) risk factors, which apart from glucose intolerance include hyperinsulinemia, dyslipidemia, hypertension, visceral obesity, hypercoagulability and microalbuminuria.[1]One common and extremely serious complication of diabetes is kidney disease. Early detection of microalbumin is important because it indicates increased risk for both renal and vascular disease. It is a marker of early diabetic nephropathy, CVD and hypertension. [8] The CVD are seen to develop in type 2 diabetic patients and this may be associated with elevated inflammatory markers. High sensitive C - reactive protein (Hs-CRP) is considered as a systemic inflammatory marker which

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shows marked increase in conformation to acute inflammation, infection and tissue injury. Hence hs-CRP can be considered as a good marker for inflammation which plays a role in the initiation and progression of CVD. [9]Therefore, the present study was planned in measure the biochemical parameters relevant to development of CVD and Kidney diseases i.e. microalbumin in urine and serum hs-CRP in type 2 diabetics.

Materials and Methods

Present study was conducted in the Department of Biochemistry, Government Medical College, Miraj. Study group included 40 patients above 40 years of age and diagnosed by clinicians as type 2 diabetes mellitus based on performing fasting blood glucose and glycosylated hemoglobin determinations. Control group included 40 health controls without any family history of diabetes and no abnormal clinical findings and matching in age with study group. The institutional Ethics Committee approved the study and consent was obtained from each participant in the study. Patients with myocardial infarction, renal diseases, coronary heart disease and type 1 diabetes mellitus were excluded from this study. Blood samples were collected from control group and study group under aseptic conditions. The first morning urine was also collected for the determination of microalbumin. The urinary microalbumin was determined immediately by latex turbidimetric method. [10] Sera samples were preserved at -20°C before hs-CRP estimation by latex turbidimetric method. [11] Statistical analysis was performed using Minitab software.

Results and discussion

The albumin excretion in the urine between 30 to 300 mg/day is known as microalbuminuria. [12] We found that, out of 40 diabetic patients 34 patients (84%) had microalbuminuria whereas 100% of control group were

non-microalbuminuric. In the present study microalbumin was also quantified and the mean microalbumin level was significantly higher in diabetic patients as compared to that of controls (Table 1, $P < 0.001$). A severe and sustained inflammatory reaction induces rapid and profound changes in the endothelium resulting in loss of barrier integrity leading to systemic capillary leak. [13, 14] This manifests as altered glomerular permeability culminating in increased renal albumin excretion in the urine. This is important indicator of deteriorating renal function. Impairment of renal function is a common microvascular complication of diabetes. [15] In our study, the mean serum hs-CRP level was significantly higher in type 2 diabetic patients as compared to controls (Table 1, $P < 0.001$). The hs-CRP method is to detect low concentration of CRP in serum required for the prediction of inflammation. Inflammation is evident from the accumulation of monocytes and macrophages at the site of plaque rupture. Remarkable increase in serum CRP level may reflect the development and progression of atherosclerosis. Inflammation has a causal role in the development of diabetes also; thus the requirement of CRP by high sensitive assays can be used to predict the risk of diabetic complications like cardiovascular and peripheral vascular diseases. [16] Mechanism involved in the alteration of hs-CRP and microalbumin may be complicated and independent of each other. Hence we observed no significant correlation between hs-CRP and microalbumin concentration, although both the parameters are raised in diabetes. To conclude, the microalbuminuria is associated with progression of chronic kidney disease and the development of cardiovascular morbidity and mortality. Serum hs-CRP is an exquisitely sensitive systemic marker of inflammation. Hence measurement of urinary microalbumin and serum hs-CRP in risk group can help the physician in better management of type 2 diabetic patients.

Table No. 1: High sensitive C-reactive protein (hs-CRP) and microalbumin levels in diabetic patients and controls

Subjects	HS-CRP (mg/L) (Mean \pm SD)	Microalbumin (mg/L) Mean \pm SD
Patients	7.02 \pm 3.94*	37.7 \pm 17.9*
Controls	1.78 \pm 1.68	9.97 \pm 5.82

The statistical method used to compare data was 't' test. * $P < 0.001$, highly significant.

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