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ORIGINAL RESEARCH

A correlative study of serum beta 2 microglobulin with serum creatinine in chronic kidney disease patients

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ABSTRACT

Background: Chronic kidney disease (CKD) isa worldwide health problem, affecting millions of people. Causes of chronic kidney disease include diabetes, high blood pressure, glomerulonephritis, polycystic kidney disease, lupus, and other forms of cardiovascular diseases. β2 microglobulin is a non-glycosylated single chain protein present in light chain of HLA-class I Antigen. It is synthesized in the body and excreted in the urine. When the glomeruli in the kidneys are damaged, they are unable to filter out β2microglobulin, so the level in the blood rises. Our study was aimed to assess and compare the status of β2microglobulin level in chronic kidney disease subjects and healthy controls. **Materials and Methods:** This was a case-control study, conducted on 220 CKD patients. Cases were selected from the Medicine OPD of Jawahar Lal Nehru Medical College and Associated Group of Hospitals, Ajmer. Age and sex-matched healthy controls (n = 100) were selected from the Medicine OPD. The study was approved by the Institutional Ethical Committee. All samples were collected under aseptic conditions from the antecubital vein. **Results:** The mean activity of serum β2microglobulin was significantly higher in CKD subjects as compared to healthy controls ($p < 0.0001$). Positive pearson correlation between serum creatinine and serum β2microglobulin was found ($r=0.62$). **Conclusion:** Serum β2microglobulin level was elevated in patients with CKD and this level progressively increased with increase in creatinine. Serum β2microglobulin can be used as a biomarker for the early detection of CKD in the general population to prevent the morbidity and mortality which are associated with CKD. If CKD is detected early and managed appropriately the deterioration in kidney functions can be slowed and the risk of cardiovascular diseases in renal patients can be reduced.

Keywords: Chronic kidney disease (CKD), Glomerular filtration rate (GFR), Serum creatinine (SCr), Beta-2-microglobulin (β2M).

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide health problem, affecting millions of people.[1] CKD represents a progressive, irreversible decline in glomerular filtration rate (GFR).[2] CKD is a type of kidney disease in which there is a gradual loss of kidney function over a period of months or years. Causes of chronic kidney disease include diabetes, high blood pressure, glomerulonephritis, and polycystic kidney disease. Loss of renal function is common in renal failure, irrespective of the underlying cause of the kidney disease. [3,4,5,6]

Serum Creatinine (SCr) the most routinely used marker for kidney dysfunction is often detected in normal range in the early stage of kidney dysfunction thus making diagnosis difficult. Effect of age, gender, ethnicity, nutritional status, and body muscle mass on the serum levels of creatinine are proven beyond doubt.[7]β2microglobulin is a non-glycosylated single chain protein present in light chain of HLA-class I Antigen. In the kidneys, β2microglobulin passes through blood-filtering units called the glomeruli and is then reabsorbed by the renal proximal tubules. Normally, only small amounts of β2microglobulin are present in the urine, but when the renal tubules become damaged or diseased β2microglobulin concentrations increase in urine due to the decreased ability to reabsorb this protein. When the glomeruli in the kidneys are damaged, they are unable to filter out β2microglobulin, so the level in the blood rises. β2microglobulin is a potentially amyloidogenic low molecular weight protein. Its serum level increases with the progression of chronic kidney disease, to reach very high concentrations in patients with chronic kidney disease.

Serum creatinine is widely accepted as the most

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common parameter to assess renal functions. The prevalence of CKD in generalpopulation was 16% in India.[8]If CKD is detected early and managed appropriately the deterioration in kidney functions can be slowed and the risk of cardiovascular diseases in renal patients can be reduced. Our study was aimed to assess and compare the status of serum β2microglobulin in chronickidney disease patients and healthy controls.

MATERIALS AND METHODOLOGY

This study was a case-control study, conducted on 220 chronic kidney disease patients. Patients were diagnosed as chronic kidney disease based on clinical history, physical examination &serum creatinine level. Cases were selected from the Medicine OPD of Jawahar Lal Nehru Medical College and Associated Group of Hospital, Ajmer. Age and sex-matched healthy controls(n=100) were selected from the Medicine OPD of Jawahar Lal Nehru Medical College and Associated Group of Hospital, Ajmer. The results of patients were compared with healthy controls (n=100). The study was approved by the Institutional Ethical Committee.

Inclusion criteria for the study group: Established cases of chronic kidney disease were taken.

For the control group: Age and sex-matched healthy individuals were included.

Exclusion criteria: Patients with acute kidney injury, acute infection, acute myocardial infarction, active liver disease or liver dysfunction, hematological and malignant overt diseases. Patients with autoimmune diseases. Kidney transplant patients. Pregnant and lactating women. Patient with thyroid disorder. Patients who were unwilling to participate in the study were excluded.

Blood samples were collected after an overnight fast (12-14hrs) under aseptic conditions from all the study participants. All samples were centrifuged and analyzed for serum creatinine, andserumβ2microglobulin. Serum creatinine was measured by Jaffe's colorimetric kinetic method.[9]Serumβ2microglobulin was measured by Turbidimetric method.[10]

STATISTICAL ANALYSIS

All data were analyzed by SPSS and $p < 0.0001$ was considered highly significant. Pearson correlation between serum creatinine and serum β2microglobulin was performed.

RESULTS

Total 320 subject were studied. Table 1 figure 1 shows the Mean ± SD levels of serum creatinine, β2microglobulin are 0.88 ± 0.42 mg/dL, 1.80 ± 1.10 mg/L, in control group respectively. It also shows the Mean ± SD levels of Serum creatinine, β2microglobulin are 7.26± 2.72 mg/dL, 8.30 ± 3.12 mg/L in CKD cases respectively. Figure 2 shows positive pearson correlation between serum creatinine and serum β2 microglobulin(r=0.62).

Table 1: Biochemical Parameters of Healthy Control Subjects v/s Chronic Kidney Disease Subjects

Parameters	Group I Healthy subjects Mean ± SD (n=100)	Group II Chronic Kidney Disease Patients Mean ± SD (n=220)	P Value
Serum creatinine (mg/dL)	0.88±0.42	7.26±2.72	P<0.0001 (HS)
Serum Beta-2-microglobulin (mg/L)	1.80± 1.10	8.30±3.12	P<0.0001 (HS)

Figure1: Comparison of Biochemical Parameters of Healthy Control Subjects and Chronic Kidney Disease Subjects

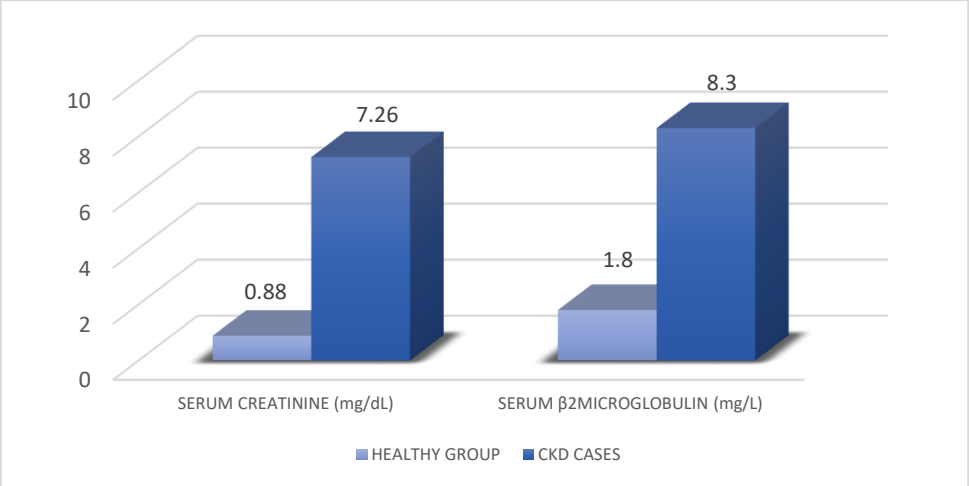

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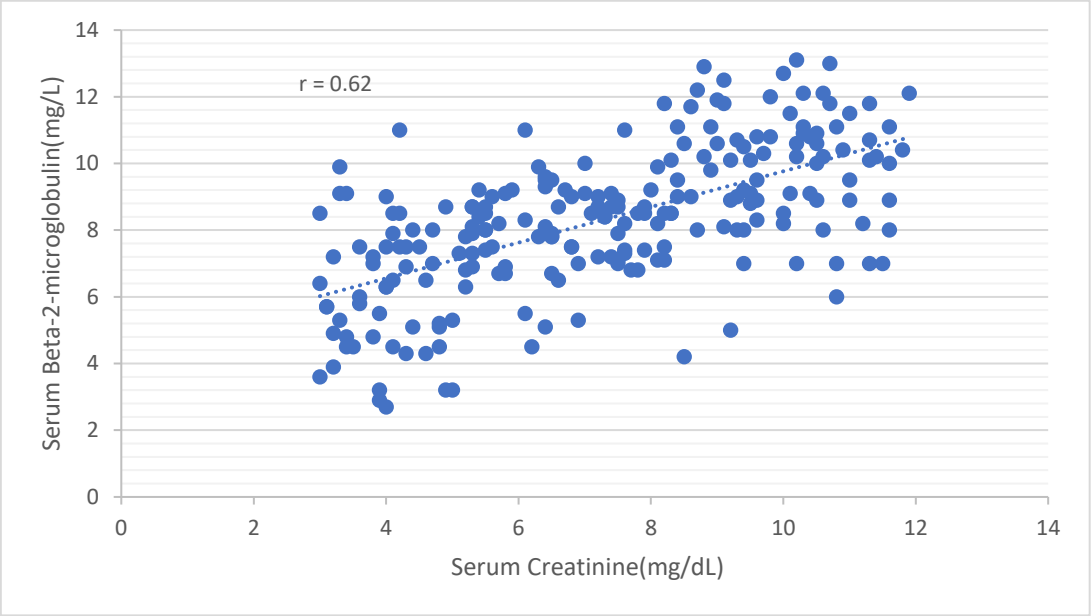
Figure 2: Pearson correlation between serum creatinine and serum β2microglobulin in CKD cases.



DISCUSSION

Chronic kidney disease (CKD)isa worldwide health problem, affecting millions of people. Causes of chronic kidney disease include diabetes, high blood pressure, glomerulonephritis, polycystic kidney disease, lupus, and other forms of cardiovascular diseases.

Serum β2microglobulin level was elevated in patients with CKD and this level progressively increased with increase in serum creatinine. Kidneys eliminate β2microglobulin via glomerular filtration and tubular catabolism and hence, serum level of β2microglobulin is highly correlated with chronic kidney disease.

In the present study the Mean± SD of Serum creatinine, β2microglobulin for control was found to be 0.88 ± 0.42 mg/dL,1.80 ± 1.10 mg/Lrespectively and the Mean ± SD of Serum creatinine, β2microglobulin for case group was found to be 7.26± 2.72 mg/dL,8.30 ± 3.12 mg/L respectively. Serum creatinine and serum β2microglobulin was significantly higher for CKD cases as compared to control group. Positive pearson correlation between serum creatinine and serum β2microglobulinwas found (r=0.62)

In the kidneys, B2microglobulin passes through blood-filtering units called the glomeruli and is then reabsorbed by the renal proximal tubules, structures that reclaim water, proteins, vitamins, minerals, and other vital substances. Normally, only small amounts of B2M are present in the urine, but when the renal tubules become damaged or diseased, B2M concentrations increase due to the decreased ability to reabsorb this protein. When the glomeruli in the kidneys are damaged, they are unable to filter out B2M, so the level in the blood rises.

Our findings are in agreement with Sedighi et al who found that the mean activity of serum β2microglobulin was significantly higher in chronic kidney disease patients compared to the healthy subjects. [11]

CONCLUSION

In the present study there was a significant increase in the level of serum Beta-2-microglobulin in CKD patients when compared to healthy controls. Present study has also revealed a positive correlation between serum creatinine and serum Beta-2-microglobulin in chronic kidney disease patients(r=0.62).

SerumBeta-2-microglobulin can be used as a biomarker for early detection of chronic kidney disease in general population to prevent morbidity and mortality which are associated with CKD.

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