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MICROALBUMIN STATUS AS AN EARLY BIOMARKER IN RELATION TO OTHERS IN KIDNEY DISEASE- A COMPARATIVE STUDY

Biochemistry

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ABSTRACT

To study efficacy of microalbumin status as an early biomarker in kidney disorder in relation and along with other biomarkers

METHODS-A comparative study was done in different 55 patients presented with symptoms of kidney disease at different stages. Four groups of 55 patients were studied. Group-I of diabetic patients, Group-II of Chronic Kidney Disease (CKD), Group-III of Acute Kidney injury (AKD) and Group-IV of patients under dialysis conditions. A detailed history and clinical examination were done.

RESULT- All the selected biomarkers included in study seems to be increased from Group I to Group IV, (except calcium) and microalbumine was found to be effective early stage biomarker.

SUMMARY: blood urea and creatinine level of patients with CKD was done as routine test and Microalbumine was suggested to consider as early stage effective biomarker which can predict at hypertensive and diabetic case.

KEYWORDS

Kidney Disease, Microalbumine, Diabetics.

INTRODUCTION-

Acute kidney injury (AKI) is defined as a functional or structural of the kidney as determined by blood or urine tests [1]. AKI is often under-recognized disorder, which is associated with a high risk for mortality, development of chronic kidney disease (CKD) and another organ dysfunction. AKI is associated with markedly increased risk of death in hospitalized individuals, particularly in those admitted to the ICU where in-hospital mortality rates may exceed 50 % [2]. In early stages, symptoms of CKD are usually not apparent. Significant reduction of kidney function is the first obvious sign of disease. If diagnosed early (stages 1 to 3), the progression of CKD can be altered and complications reduced [3]. In stages 4 and 5 extensive kidney damage is observed which usually results in end-stage renal failure. Urine seems to be a better material for clinical diagnostics than blood because it can be collected non-invasively and it is relatively stable, probably due to long "storage" in the bladder. The collection of blood is inevitably associated with the activation of proteases and, consequently, with the generation of proteolytic breakdown products which are inevitably associated with its collection [4,5].

Biomarker suitable for monitoring of CKD ought to have narrow biological variability in order to improve the assessment of longitudinal changes. Moreover, it should not be influenced by age, nutrition status or concurrent health concerns. A good biomarker should provide rapid, non-invasive and specific measurements correlating well with kidney tissue pathology [6]. Furthermore, good markers should be highly sensitive, specific for renal diseases, correlate with histopathological results of renal biopsy and disease progression, and enable the identification of early stages of renal impairment disease and prognosis [7].This prospective observational study was aimed to study the effectiveness of Microalbumin level as an early biomarker along with the clinical examination of Blood urea level, Serum Creatinine, Calcium ,Phosphorous level and BSL-R in different groups were compared.

MATERIALS AND METHODS

CREATININE

This assay is used for the quantitation of creatinine in human serum, plasma or urine. At an alkaline P^{H}, creatinine in the sample reacts with picrate to form a creatinine-picrate complex. The rate of increase in absorbance at 500 nm due to the formation of this complex is directly proportional to the concentration of creatinine in the sample. For Kinetic Alkaline Picrate the Architect System operations manual was used.

CALCIUM

This assay is used for the quantitation of calcium in human serum, plasma or urine. Arsenazo-III dye reacts with calcium in an acid solution to form a blue-purple complex. The color developed is measured at 660 nm and is proportional to the calcium concentration in the sample.

PHOSPHORUS

This assay is used for the quantitation of phosphorous in human serum, plasma or urine. Inorganic phosphorous reacts with ammonium molybdate to form a heteropolyacid complex. The use of a surfactant eliminates the need to prepare a protein-free filtrate. The absorbance at 340 nm is directly proportional to the inorganic phosphorous level in the sample. Sample blanks must be run to correct for any non-specific absorbance in the sample.

UREA NITROGEN

This assay is used for the quantitation of urea nitrogen in human serum, plasma or urine. It is a modification of a totally enzymatic procedure first described by Talke and Schubert. The test is performed as a kinetic assay in which the initial rate of the reaction is linear for a limited period of time. Urea in the sample is hydrolysed by urease to ammonia and carbon oxide. The second reaction, catalysed by Glutamate dehydrogenase (GLD) converts ammonia and α-ketoglutarate to glutamate and water with the concurrent oxidation of reduced nicotinamide (NAD). Two moles of NADH are oxidised for each mole of urea present. The initial rate of decrease in absorbance at 340 nm is proportional to the urea concentration in the sample.

MICROALBUMIN

This is used for the quantitative measurement of albumin in human urine on the ARCHITECT cSystem. This is a turbidimetric immunoassay that uses polyclonal antibodies against human albumin. When a specimen is mixed with the reagents, albumin in the specimen combines with the anti-human albumin antibody (goat) in the reagent to yield an insoluble aggregate that causes increased turbidity in the solution. The degree of turbidity is proportional to the concentration of albumin in the specimen, and can be measured optically.

RESULTS-

Four groups of 56 patients were studied. Group-I of diabetic patients, Group-II of Chronic Kidney Disease (CKD), Group-III of Acute Kidney injury (AKD) and Group-IV of patients under dialysis conditions in the department of medicine of YCM.

In Group-I of diabetic patients, out of 56 patients, 27 were male and 28 were female while Group-II of Chronic Kidney Disease (CKD) included out of 55 patients, 31 males and 24 females. In Group-III of Acute Kidney injury (AKD), out of 55 patients, 34 were male and 21 were female. In Group-IV of patients under dialysis conditions, out of 55 patients, 43 were male and 12 were female. All the selected

biomarkers included in study seems to be increased from Group I to Group II such as Blood urea level, Serum Creatinine, Calcium, Phosphorous level, BSL-R and Microalbumin level.

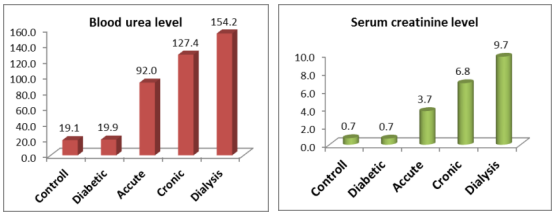

Figure 1: comparative analysis of blood urea and serum creatinine level as biomarkers in early stage to late stage of kidney dysfunction.

UREAAND CREATININE LEVEL:

Serum urea level and creatinine level are routinely used as a prognostic markers and predictors of renal damage. Blood urea and serum creatinine are good indicators of a normal functioning of kidney. Increase serum levels of these parameters are indication of kidney dysfunction. In diabetic patients at earlier stage, no significant increase was found. As kidney diseases progresses, the level of urea, creatinine raises in acute, chronic and dialysis patients. Our results predict that blood urea level was found to be highest in dialysis case (154.2 mg %) whereas 19.9 mg% or slightly more than normal range was found in diabetic case. From these results we can conclude that slight change in blood urea indicates early stage marker as prognostic factor found in kidney diseases.

Our results about creatinine level indicates that serum creatinine level was found to be equal in control and diabetic patients whereas it starts increasing in acute, chronic and dialysis patients (Figure 1)

CALCIUM AND PHOSPHOROUS LEVEL:

Kidney function stops activating calcitriol and do not remove phosphorous from the blood hence increase in phosphorous level results in decrease in calcium level. In present study calcium level was decreases from 9.9 mg% to 7.8 mg% from control to dialysis level respectively. Present study also helps to prove the concept of dependency in calcium and phosphorous in kidney dysfunction (Figure 2).

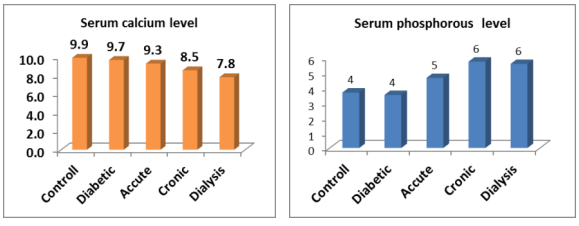

Figure 2: comparative analysis of calcium and phosphate level in early stage to late stage of kidney dysfunction.

MICROALBUMINE LEVEL IN DIABETIC PATIENTS:

Microalbumine is significant risk factor for cardiovascular, diabetic and hypertensive patients. Microalbumine is one of the primary proteins to leak from kidney when it is damaged and therefore we carried comparative study of blood sugar and microalbumine and was aimed to find early stage marker in this study (Figure 3). The average blood sugar found in 55 patients were 235.5 mg% these patients were observed for micro albumin test and found with significant increase. From this figure and observation we can conclude that if diabetic patients were checked with micro albumin level, Primary stage of kidney damage can be detected.

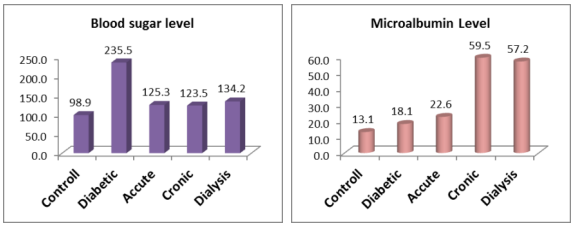

Figure 3: comparative analysis of blood sugar level and microa lbumine as early biomarkers in early stage to late stage of kidney dysfunction.

CONCLUSION-

Early diagnosis of kidney disease and identification of those likely to progress to end-stage renal disease (ESRD) has become highly important. Existing measures including creatinine level, estimated glomerular filtration rate (eGFR) and proteinuria seem to be insufficient. Therefore, new validated biomarkers are required for disease progression and cardiovascular disease (CVD) risk. On the basis of above mentioned studies, it can be concluded that a microalbumin level can be considered as an early effective marker along with others such as Blood urea level, Serum Creatinine, Calcium, Phosphorous level and BSL-R. Slight change of microalbumine in diabetic patients may lead to acute or chronic kidney disease. Hence we want to suggest from this study that every diabetic patient has to go for microalbumine check-up so that they could diagnose their kidney function in early stage with micro albumin as effective early stage marker.

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