STUDY OF SERUM ALBUMIN AND LIPID PROFILE IN CHRONIC KIDNEY DISEASE – A CASE CONTROL STUDY.

Biochemistry

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ABSTRACT

Cardiovacular disease (CVD) is the most common cause of mortality and morbidity in Chronic Kidney Disease(CKD). Risk factors such as hypoalbuminemia and dyslipidemia causes premature development of CVD. This study was undertaken to measure serum albumin and lipid profile in CKD patients and healthy controls. It was found that hypoalbuminemia and decreased HDL levels were seen in CKD patients. Hence identifying them in early stage and managing it might help in reducing the CVD risk in CKD patients.

Summary: Hypoalbuminemia indicates the inflammation in CKD patients. Decreased HDL levels in CKD might contribute in increasing the risk of cardiovascular complications. Hence identifying these abnormalities early in the disease process may help the clinician to effectively manage the developments of cardiovascular complications in CKD patients at an earlier stage.

KEYWORDS

Chronic Kidney Disease, Cardiovascular disease, hypoalbuminemia, dyslipidemia.

INTRODUCTION:

Chronic kidney disease (CKD) caused by different etiologies like diabetes, hypertension, etc., pose a greater need for the control of the primary diseases because it leads to end stage renal disease (ESRD)1. In India, It has been estimated that the prevalence of CRF in India may be up to 785 people per million population2.Cardiovascular disease (CVD) is the most common cause of morbidity and mortality in patients with chronic kidney disease (CKD). Although traditional risk factors such as diabetes mellitus, hypertension and old age are prevalent in CKD, they may not be sufficient by themselves to account for the high prevalence of CVD in them. Hence the study of non-traditional associated risk factors that is involved in the pathogenesis of CVD in CKD patients becomes necessary[3].

One of the factors contributing to the pre-mature development of CVD is hypoalbuminemia4. CKD by various mechanisms causes abnormal lipid metabolism leading on to hyperlipidemias. Hence this study was undertaken to measure the levels of serum albumin and serum lipid levels to know the degree of hypoalbuminemia and dyslipidemia at different stages of CKD in the rural population of Kolar.

AIMS & OBJECTIVES:

To measure serum albumin and lipid profile in chronic kidney disease cases and controls.

MATERIALS AND METHODS:

This is a case control study done in RL Jalappa Hospital and Research Centre, Kolar. Data of 40 patients more than 18 years of age with CKD at stage II, III, IV based on eGFR were included as cases and 40 healthy subjects as controls. Both the cases and controls were age and sex matched. Patients with stage I & V CKD, ARF, CVD, Thyroid disorders, Hypoalbuminemia were excluded from the study.

After obtaining informed consent, 5ml of blood after 12 hours fasting from the study group and the control group was drawn under complete aseptic precautions. Samples were collected before dialysis.

Parameters estimated were blood glucose by glucose oxidase-peroxidase method, blood urea by glutamate dehydrogenase kinetic method, Serum creatinine by Jaffe's Kinetic method, Serum albumin by bromocresol green method. Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein were estimated by enzymatic method.GFR (mL/min/1.73 m2) = 186 x (SCr)-1.154 x (age)-0.203 x (0.742 if female) x (1.210 if African American).eGFR was calculated using MDRD(Modification of Diet in Renal Disease) formula[5].

The results were obtained and values were tabulated. An Independent t test was done to compare between the cases and controls and for the comparison between the stages of the CKD.

RESULTS:

Mean age of the CKD cases was 59.83 ± 10.85 and control group was 58.93 ± 10.96. The percentage of females in the cases and controls were 35% and the percentage of males were 65%. The mean serum albumin levels were reduced in cases (2.85 ± 0.56 g/dl) compared to the controls (3.93 ± 0.42 g/dl) which was highly significant statistically (p < 0.001) as shown in the table 1. The mean serum HDL levels were reduced in cases (28.58 ± 12.55 mg/dl) compared to the controls (33.83 ± 9.28 mg/dl) which was significant statistically (p < 0.05) as shown in the table 1. There was no significant difference in the serum levels of cholesterol, triglycerides and LDL between the CKD cases and the controls as shown in the table 1. Out of 40 CKD cases 62.5% were in stage 3 and the rest 37.5% were in stage 4 as shown in figure 2. There was no significant difference in the serum levels of albumin, cholesterol, triglycerides, HDL and LDL between the stage 3 and stage 4 of the CKD cases as shown in the table 2.

TABLE 1: INDEPENDENT t TEST COMPARING THE MEAN VALUES OF THE PARAMETERS BETWEEN THE CASES OF CKD AND CONTROLS.

PARAMETERS	CASES	CONTROLS	t VALUE	p VALUE
Random Blood Sugar (mg/dl)	188.6 ± 91.25	107.75 ± 22.68	5.44	<0.001**
Blood Urea (mg/dl)	65.23 ± 24.51	30.60 ± 8.69	8.42	<0.001**
Serum Creatinine (mg/dl)	2.2 ± 0.51	0.82 ± 0.2	15.97	<0.001**
eGFR (ml/min/1.73m2)	28.38 ± 8.10	94.08 ± 22.95	-17.07	<0.001**
Serum Albumin (g/dl)	2.85 ± 0.56	3.93 ± 0.42	-9.77	<0.001**
Serum Cholesterol (mg/dl)	148.25 ± 64.35	154 ± 36.6	-0.49	0.62
Serum Triglycerides (mg/dl)	171.25 ± 94.35	153.6 ± 55.45	1.02	0.31
Serum HDL (mg/dl)	28.58 ± 12.55	33.83 ± 9.28	-2.13	0.04*
Serum LDL (mg/dl)	85.50 ± 53.68	89.57 ± 30.03	-0.42	0.68

* SIGINIFICANT   ** HIGHLY SIGNIFICANT

TABLE 2: INDEPENDENT t TEST COMPARING THE MEAN VALUES OF THE STUDY PARAMETERS BETWEEN DIFFERENT STAGES OF CKD.

PARAMETERS	STAGE 3	STAGE 4	t VALUE	p VALUE
Serum Albumin (g/dl)	2.85 ± 0.44	2.85 ± 0.63	0.029	0.9
Serum Cholesterol (mg/dl)	142.33 ± 40.54	151.8 ±7 5.74	-0.446	0.6
Serum Triglycerides (mg/dl)	176.8 ± 87.68	167.92 ± 99.74	0.285	0.7
Serum HDL (mg/dl)	25.2 ± 8.58	30.6 ± 14.19	-1.331	0.1
Serum LDL (mg/dl)	81.8 ± 32.18	87.7 ± 63.75	-0.334	0.7

* SIGNIFICANT

DISCUSSION:

The present study was a case control study done by selecting 80 subjects of which 40 were cases of CKD and 40 were age and sex matched normal healthy controls. The percentage of males in the cases and controls were 65% and females were 35%. Staging of CKD patients was done based on eGFR calculated using MDRD formula. The levels of serum albumin were found to be significantly reduced in the cases when compared with the controls. This is because, renal glomeruli become progressively permeable with advancing renal disease and this leakiness leads to increased urinary albumin excretion causing hypoalbuminemia in CKD patients[6]. The analysis did not show any significant difference in the levels of serum albumin between stage 3 and stage 4 of CKD.

Kaysen et al described that serum albumin levels have been shown to decrease in situation of volume overload, which is highly prevalent in CKD patients[7]. Acchiardo et al proposed that hypoalbuminemia is caused by malnutrition in CKD in a study involving 120 hemodialysis patients[8]. It is noted that inflammatory processes occuring due to increase in pro-inflammatory cytokines in CKD cases itself can lead to marked hypoalbuminemia by suppressing albumin synthesis[9,10,11]. Another mechanism which contributes is buildup of uremic toxins that depresses albumin synthesis by the liver and thus, there is an increase in intravascular and extra vascular fluid volume, due to which the albumin level remains mildly subnormal[12,13]. The present study also revealed these findings.

In the present study there was no significant difference between the stage 3 and stage 4 albumin levels, because as the glomerular filtration rate falls and chronic renal failure sets in, proteins are no longer lost in large quantity in the urine, and albumin degradation in the proximal tubules subsides[14].

In the present study mean levels of HDL is significantly reduced in CKD cases compared to controls. Many studies, such as the one conducted by Massy et al[15], Das et al[16] and Shoji et al[17] have also observed the same results. It may be due to decreased activities of LPL, hepatic triglyceride lipase (HTGL), lecithin cholesterol acyl transferase (LCAT) and increased concentration of cholesterol ester transfer protein (CETP) and decreased apolipoprotein concentrations[18].

Increased oxidative stress caused due to hypoalbuminemia[19] may cause sub-endothelial inflammation which when added with CKD induced dyslipidemia increases the risk for cardiovascular complication in CKD patients.

CONCLUSION:

Hypoalbuminemia indicates the inflammation in CKD patients. Along with it, decreased HDL levels in CKD might contribute in increasing the risk of cardiovascular complications. Hence identifying these abnormalities early in the disease process may help the clinician to effectively manage the developments of cardiovascular complications in CKD patients at an earlier stage

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