



Correlation of Serum Adiponectin with hs CRP, eGFR and BMI in CKD Patients in Comparison to Healthy People.

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Abstract

Introduction: Chronic kidney disease (CKD) is a unique condition with exceedingly high incidence of insulin resistance and cardiovascular morbidity and mortality. **Aim of the study:** To see the correlation of serum adiponectin with hs CRP, eGFR and BMI in CKD patients in comparison to healthy people. **Material & Methods:** This cross sectional study was conducted at the Department of Nephrology and Department of biochemistry of National Institute of Kidney Diseases and Urology, Dhaka. A total of 149 patients were included for the study from January 2018 to December 2018. Among them 112 were predominantly patients of CKD stage 3 to 5 and rest of 37 healthy people were enrolled in this study as Group I and Group II respectively. Purposive sampling technique was used. Statistical analysis of the results was done by using computer based statistical software, SPSS (SPSS Inc, Chicago, IL, USA). Prior to the commencement of the study, the ethical committee of NIKDU, Dhaka, approved the thesis protocol. **Results:** Mean age was 50.45 ± 10.45 years and 36.55 ± 8.35 years in Group I and Group II. Males were little higher in CKD groups. Serum adiponectin level was significantly higher in female both in group I and group II. 51% of our CKD patients had Glomerulonephritis as a primary cause. Serum creatinine, S. adiponectin were significantly higher and eGFR were significantly lower in Group I comparing to Group II. BMI and eGFR were found significantly lower in G5 patients comparing G3 and G4 patients. Hs CRP and Serum adiponectin were found significantly higher in G5 patients than G3 and G4 patients. Hs CRP and Serum adiponectin were found significantly higher in G5 patients than G3 and G4 patients. **Conclusion** According to the study, S. adiponectin was found significantly higher in CKD patients in comparison to healthy people. S. Adiponectin, serum creatinine and hs CRP were found higher whereas eGFR, BMI were found lower in CKD patients in comparison to healthy people.

Keywords: Cardiovascular, Insulin, CKD, Adiponectin, Glomerulonephritis.

INTRODUCTION

Chronic kidney disease (CKD) is a unique condition with exceedingly high incidence of insulin resistance and cardiovascular morbidity and mortality.^[1] Abnormal glucose, insulin and lipoprotein metabolism are common in patients with chronic kidney disease. Having multiple etiologies, CKD is defined as a state of kidney damage and/or decreased glomerular filtration rate that lasts for at least 3 months.^[2] Diabetes, hypertension and obesity are the leading cause and risk factors of chronic kidney disease in all developed and many developing countries. However, glomerulonephritis and unknown causes are more common in countries of Asia and sub-Saharan Africa. According to this, CKD can be divided into 5 stages depending on the presence of kidney damage, i.e., albuminuria, and loss of kidney function as assessed by glomerular filtration rate (GFR). CKD is usually characterized by a progressive course of worsening renal function eventually leading to stage 5 CKD, also called end-stage renal disease (ESRD), which requires renal replacement therapy (RRT). Currently, two major kinds of RRT are clinically available, dialysis and kidney transplantation. Dialysis is furthermore available as hemodialysis (HD, entailing extracorporeal filtration of blood) or peritoneal dialysis (PD, which utilizes the peritoneal membrane as a filter). CKD is paradoxically associated with elevated plasma adiponectin. Plasma adiponectin level is dependent on kidney function, being markedly increased among patients with kidney impairment.^[3] Specifically, adiponectin increases in patients with chronic renal failure as because adiponectin is excreted via glomerular filtration.^[4] Adiponectin levels in hemodialysis patients is 2.5-3 times more than that in healthy people. Such an increase is

associated with decreased renal function, disorder in the regulation of the type and rate of serum levels, and disorder in adiponectin receptors.^[5] In CKD, increased adiponectin is considered as one of the new risk factors for atherosclerosis, and it changes into one of the most important causes of mortality in these patients.^[6] It has also been stated that, there is an association between serum adiponectin level and other risk factors for atherosclerosis, including traditional and new factors.^[7] Patients with chronic renal failure adiponectin is a predictor of mortality and progression of renal failure.^[8] This suggests that the biological protective effect of adiponectin against cardiovascular diseases is decreased in uremic patients.^[9] Therefore, investigating the determinants of adiponectin levels in CKD patients is important to understand the relationship between this adiponectin and mortality, which is extremely high from the very early stages of CKD.

MATERIALS & METHODS

This cross sectional study was conducted at the Department of Nephrology and Department of biochemistry of National Institute of Kidney Diseases and Urology, Dhaka. A total of 149 patients were included for the study from January 2018 to December 2018. Among them 112 were predominantly patients of CKD stage 3 to 5 and rest of 37 healthy people were enrolled in this study as Group I and Group II respectively. Purposive sampling technique was used as per inclusion and exclusion criteria. Blood samples were collected from the selected patients and samples were marked as "Sample A" and "Sample B". At the same time fasting blood samples were collected from the healthy persons and samples were marked as "sample C" and used as Group II. Adiponectin has

been measured from “sample A” for Group I and “sample C” for Group II. Serum Adiponectin were done for each patient from “Sample A” and other laboratory parameters were done from “Sample B”. Serum calcium, inorganic phosphate, CRP, s. creatinine, s. albumin, s. total protein, haemoglobin were measured from “sample B” for Group I and sample c” for Group II. Statistical analysis of the results was done by using computer based statistical software, SPSS (SPSS Inc, Chicago, IL, USA). Prior to the commencement of the study, the ethical committee of NIKDU, Dhaka, approved the thesis protocol.

- **Inclusion Criteria**
 - Age more than 18 years.
 - Patients of CKD G 3a, 3b, 4 and 5.
- **Exclusion Criteria**
 - Patients with acute kidney injury
 - H/O IHD, MI
 - H/O stroke
 - Chronic liver disease
 - Age bellow 18 years

RESULTS

Table I shows distribution of study subjects according to age in Group I and Group II. Mean age was 50.45 ± 10.45 years and 36.55 ± 8.35 years in Group I and Group II. Table II shows distribution of the study subjects

according to gender in Group I and Group II. There was no significant difference between Group I and Group II. Table III shows Serum adiponectin level was significantly higher in female in both group I and group II. 51% of our CKD patients had Glomerulonephritis as a primary cause. In 21% cases of CKD had Diabetes Mellitus, 12% cases had Hypertension. In 16% cases of CKD patient, primary cause is undetermined (Figure I). Table IV shows, serum creatinine, S. adiponectin were significantly higher and eGFR were significantly lower in Group I comparing to Group II. Table V shows, Waist circumference, BMI, eGFR level were found significantly lower in G5 patients comparing G3 and G4 patients. Serum creatinine level was found significantly higher in G5 patients comparing G3 and G4 patients. Table VI shows Hs CRP and Serum adiponectin were found significantly higher in G5 patients than G3 and G4 patients. Table VII shows, S. Adiponectin positively correlated with serum creatinine, hs CRP and negatively correlated with eGFR in-group I. S. Adiponectin, Hs CRP and Serum adiponectin were found significantly higher in G5 patients than G3 and G4 patients. Hs CRP and Serum adiponectin were found significantly higher in G5 patients than G3 and G4 patients. Adiponectin negatively correlated with hs CRP in-group II. Table VIII shows, waist circumference, S. adiponectin is significantly higher in-group I with $hs\ CRP > 3$.

Table I: Distribution of study subjects according to age in Group I and Group II (n=149)

Age (years)	Group I(n=112)	Group II(n=37)	p-value
20 - 29	1 (1)	8 (22)	
30 - 39	15 (14)	17 (46)	
40 - 49	28 (25)	10 (27)	
50 - 59	43 (38)	2 (5)	
≥60	25 (22)	0 (0.0)	
Mean±SD	50.45 ± 10.45	36.55 ± 8.35	<0.001
Unpaired t test was done to measure the level of significance			

Table II: Distribution of the study subjects according to gender in group I and group II (n=149)

Gender	Group I(n=112)	Group II(n=37)	p-value
Male 75 (50.3%)	57 (50.9)	18 (48.6)	0.813
Female 74 (49.7%)	55 (49.1)	19 (51.4)	0.813

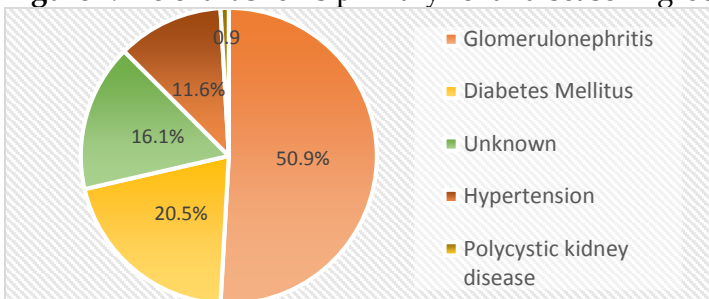
Chi-square test was done to measure the level of significance.

Table III: S. Adiponectine in male and female in group I (n=112) & group II (n=37)

Gender	Group I(Mean ± SD)	Group II(Mean ± SD)	p-value
Male	15.39 ± 9.26	7.24 ± 4.68	0.019
Female	19.17 ± 7.54	9.88 ± 3.90	0.023

Unpaired t test was done to measure the level of significance

Figure I: Pie chart shows primary renal disease in group I



Primary renal disease in group I (n=112)

Table IV: Baseline characteristics of the study subjects in group I and group II (n=149)

	Group I(n=112)	Group II(n=37)	p-value
Age (year)	50.45 ± 10.45	36.55 ± 8.35	<0.001
Waist (cm)	84.74 ± 11.01	87.69 ± 9.34	0.211
Hip (cm)	87.75 ± 8.26	91.17 ± 5.76	0.059
BMI (kg/m ²)	24.49 ± 4.02	25.97 ± 4.26	0.107
S. Creatinine (mg/dl)	3.00 ± 1.63	0.83 ± 0.16	<0.001
eGFR (ml/min/1.73m ²)	16.66 ± 9.74	94.77 ± 29.39	<0.001
S. Adiponectin(µg/ml)	17.25 ± 8.62	8.56 ± 4.30	<0.001

Unpaired t test was done to measure the level of significance

Table V: Baseline characteristics of the study subjects according to different CKD stages in group I (n=112)

	G 3(n=22)	G 4(n=46)	G 5(n=44)	p-value
Age (year)	50.23 ± 9.84	49.63 ± 10.91	51.47 ± 10.63	0.584
Waist (cm)	90.77 ± 9.58	84.05 ± 11.55	81.89 ± 9.97	0.009
Hip (cm)	89.11 ± 7.34	89.10 ± 6.37	85.51 ± 10.13	0.127
BMI (kg/m ²)	27.02 ± 3.87	23.86 ± 3.71	23.83 ± 3.99	0.010
S. Creatinine (mg/dl)	1.60 ± 0.17	2.22 ± 0.37	4.51 ± 1.65	<0.001
eGFR (ml/min/1.73m ²)	30.43 ± 3.49	19.67 ± 6.16	7.65 ± 3.48	<0.001
S. Adiponectine(µg/ml)	15.64 ± 8.32	15.67 ± 7.83	19.66 ± 9.17	0.058

ANOVA test was done to measure the level of significance.

Table VI: Baseline characteristics of risk factors in different CKD stages of group I (n=112)

	G 3(n=22)	G 4(n=46)	G 5(n=44)	p-value
Cholesterol (mg/dl)	190.74 ± 53.85	173.34 ± 72.94	166.98 ± 49.25	0.369
S. Adiponectine(µg/ml)	15.64 ± 8.32	15.67 ± 7.83	19.66 ± 9.17	0.058
hs CRP(mg/L)	2.97 ± 1.36	3.04 ± 1.07	3.62 ± 1.08	0.026

ANOVA test was done to measure the level of significance

Table VII: Correlation of S. Adiponectine with waist circumference, hip circumference, BMI, S. Creatinine, eGFR, cholesterol, hs CRP in group I and group II (n=149).

	Group I		Group II	
	r value	p value	r value	p value
Waist	-0.103	0.304	0.071	0.729
Hip	0.001	0.992	-0.072	0.740
BMI	-0.061	0.575	0.049	0.811
S. Creatinine	0.189	0.046	0.083	0.623
eGFR	-0.133	0.178	-0.125	0.467
Cholesterol	-0.082	0.412	0.153	0.365
hs CRP	0.675	<0.001	-0.541	<0.001

Pearson's correlation was done to measure the level of significance

Table VIII: Comparison of clinical & laboratory parameters for different hs CRP cut-off values in-group I study subjects.

	hsCRP ≤3 mg/l	hsCRP>3 mg/l	p-value
Waist (cm)	82.65 ± 12.01	87.49 ± 9.10	0.011
Hip (cm)	87.06 ± 7.67	89.53 ± 7.99	0.094
BMI (kg/m ²)	24.06 ± 4.22	25.46 ± 3.93	0.070
Cholesterol (mg/dl)	167.45 ± 47.14	174.98 ± 63.80	0.448
S. Adiponectin (µg/ml)	10.24 ± 5.23	21.54 ± 8.02	<0.001

Unpaired t test was done to measure the level of significance

DISCUSSION

In this study, mean age was 50.45 ± 10.45 years and 36.55 ± 8.35 years in Group I and Group II respectively. In the study of Sedighi and Abediankenari,^[10] they found mean age of the CKD patients was 65.1 ± 12.6 years and 61.04 ± 8.23 in healthy people.^[11] Menon et al found mean age 52.0 ± 12.0 years in CKD patients. Males were little higher in CKD groups.^[12] Males were higher in the study of Sedighi and Abediankenari.^[10] In this study S. adiponectin in male was 15.39 ± 9.26 in group I and 7.24 ± 4.68 in group II. In female it was 19.17 ± 7.54 and 9.88 ± 3.90 in group I and group II respectively. Zoccali et al,^[12] found

significantly higher level of adiponectin among female patients in Caucasians and Lim et al,^[13] found significantly higher level of adiponectin among female patients in Asians. In our study 51% of our CKD patients had Glomerulonephritis as a primary cause. In 21% cases of CKD had Diabetes Mellitus, 12% cases had Hypertension. In 16% cases of CKD patient, primary cause is undetermined. Ghonemy et al,^[14] found 17.0% DM and 14.0% hypertension in their study. In glomerulonephritis patients s. adiponectin level was 19.57 ± 8.23, in case diabetes mellitus it was 15.09 ± 8.94. Serum adiponectin level was found significantly higher in CKD patients comparing healthy controls.^[10] In this

study S. adiponectin ($\mu\text{g}/\text{ml}$) in group I was 17.25 ± 8.62 and in group II was 8.56 ± 4.30 . It was also observed in our study that raised level of s. adiponectin was incremental to the CKD stages. In our study s. adiponectin ($\mu\text{g}/\text{ml}$) level were 15.64 ± 8.32 , 15.67 ± 7.83 and 19.66 ± 9.17 for CKD stage 3, stage 4 and stage 5 respectively. Kamimura et al,^[15] also stated that s. adiponectin was increased as the renal function deteriorated. Lee et al,^[16] showed in their study that CRP was significantly elevated in patients with CKD. Hs CRP is a well-recognized risk factors for CVD and mortality in the general population as well as in patients with ESRD. In our study hs CRP was raised in group I patient compared to group II. It was incremental according to the stage of CKD. When s. adiponectin level increased hsCRP (mg/L) level also significantly increased. In stage 3 it was 2.97 ± 1.36 , and 3.04 ± 1.07 , 3.62 ± 1.08 for stage 4 and 5 respectively. This significant increased level of hs CRP is associated with increased cardiac morbidity and mortality in CKD patients. In-group II, s. adiponectin level was negatively correlated with hs CRP level. Waist circumference (96.50 ± 10.13), hip circumference (95.83 ± 6.27), were significantly higher in group I. Waist circumference (87.49 ± 9.10), S. adiponectin (21.54 ± 8.02) were significantly higher in group I with hs CRP $>3\text{mg}/\text{l}$. Abdallah et al,^[17] stated that Adiponectin levels correlate

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significantly with several metabolic factors. S. adiponectin levels in CKD patients are associated positively with HDL, hs CRP and negatively with triglyceride levels, BMI, LDL, and left ventricular mass index. Yatagai et al,^[18] have shown that plasma adiponectin level is inversely correlated with some metabolic syndrome factors such as BMI and type 2 diabetic mellitus. In this study, S. adiponectin was positively correlated with serum creatinine and hs CRP whereas negatively correlated with eGFR, BMI in CKD patients in comparison to healthy peoples.

Limitations of the study:

The sample size of participants were relatively small. The present study was conducted at a short period of time. The study subjects were selected from single center, so the study result may not represent the exact picture of the country.

CONCLUSION

According to the study, S. adiponectin was found significantly higher in CKD patients in comparison to healthy people. S. Adiponectin, serum creatinine and hs CRP were found higher whereas GFR, BMI were found lower in CKD patients in comparison to healthy people.

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