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Relationship between Inflammation Marker and Some Biochemical Parameters in Patients with Acute Renal Injury

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Abstract

Little information is available on the relationship between serum C reactive protein with albumin, urea, creatinine, sodium, potassium and phosphate levels for patients with Acute Renal injury. The sample of this study consists of 30 patients and 30 apparently healthy individuals. The results showed that the levels of C reactive protein, urea, creatinine, potassium and phosphate marked increase in (all patient groups) regardless to their age in compare with (control group) ($P \leq 0.05$).While levels of Albumin and sodium shows marked decrease in all patients group regardless to their age in comparison with the control group ($P \leq 0.05$). It was found positive relationship between C reactive protein and levels of each urea, creatinine, potassium and phosphate. Also it was found negative correlation between C reactive protein and levels of the albumin and sodium.

Keywords: Acute kidney injury, urea, creatinine, C reactive protein, albumin, electrolyte.

1. Introduction

Renal injury is a systemic disease and is the final common pathway of many different kidney and urinary tract diseases. Each year an estimated 42,000 Americans die of irreversible kidney injury (1-3). Renal injury induces a progressive and slow decline in kidney function enhanced by diverse factors including infections, auto immune diseases, diabetes and other endocrine disorders, cancer, and toxic chemicals (3).

Acute renal injury (ARI) is a syndrome describe by fast decline in glomerular filtration rate (GFR), retention of nitrogenous waste products, and perturbation of extracellular fluid volume with electrolytes and acid-base homeostasis (4,5) . Acute renal injury is sudden and almost full loss of kidney function caused by failure of renal circulation or by tubular or glomerular dysfunction.

Regardless of the volume of urine excreted, the patient with acute renal failure experiences rising serum creatinine and blood urea level that excreted by the kidney (6-8). Any condition that causes reduction in renal blood flow, such as volume depletion, hypotension, or shock, leadsto a reduction in glomerular filtration, renal ischemia, and tubular damage.

Renal failure may also result from the adverse effects of burns, crushing injuries and infection as well as from nephrotoxic agents that cause acute tubular necrosis and temporary cessation of renal function (9-14). Renal hypo perfusion leading to ischemia is considered the most likely cause of ARI in sepsis (12). Accordingly, the diagnosis of acute renal injury in terms of its cause or mechanism has been describe as (pre renal "hypoperfusion") or (intra renal "acute tubular necrosis–ATN").In the absence of a kidney biopsy, it is not usually performed in critically ill patients, The separation of the two preconditions depends on urinary biochemistry and derived indicators such as urine sodium concentration (UNa), urine osmolality, partial excretion of sodium (FeNa), urea nitrogen excretion (FeUn), renal failure index (RFI) and urine creatinine ratio Plasma (U / P ratio Cr) (13, 15),.However, there are limited data regarding the diagnostic power of these tests in acute

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septic kidney injury. Important risk factors are (earlier cardiovascular disease, old age, tobacco smoking, high blood levels of certain lipids (LDL and TG) and small levels of (HDL) cholesterol, diabetes, high blood pressure, lack of physical activity, obesity, chronic kidney disease, excessive alcohol consumption and the use of cocaine and amphetamines)(16 ,17). The study aimed to observe levels the serum C reactive protein albumin, urea, creatinine, sodium, potassium and phosphate levels. Also to evaluate correlation between serum C reactive protein with albumin, urea, creatinine, sodium, potassium and phosphate levels

2. Materials and methods

At AL-Hussein Teaching Hospital in Thi- Qar governorate. This study has been conducted. At the duration between (17/5/2019) to (25/9/2019). The study including (60subjects), (30 control) and (30 patients). Each one of this groups divided according to age to (elderly and adult) .A 5 mL-blood sample was pulled from each (controls and patients). Samples were allowed to coagulate at room temperature in empty disposable tubes, then centrifuged at 3000 xg for 10 minutes. Serum samples were separated and stored at (-20 ° C) for subsequent measurement of biochemical parameters, unless used immediately. The serum was used for the estimation of CRP it was measured according to the method of (18) .The used reagents were supplied by (Boditech , Korea). (Alb) was measured according to the method of (19). Urea was measured according to the method of(20). The used reagents were supplied by (Randox, France). (Creatinin) was measured according to the method of (21). (Sodium) was measured according to the method of (22). Potassium was measured according to the method of (22,23) .(Phosphate) was measured according to the method of(22).All the used reagents (Alb, urea, creatinin, sodium, potassium and phosphate) were supplied by Randox, France.

Statistical Analysis: statistical analysis was done using statistical package for the social sciences version 23, results were expressed the (mean ± standard deviation). T test was applied to compare between parameters in all studied groups. P-values ($P \leq 0.05$) were considered,. Pearson's correlation was applied to make the relationship among the present study parameter.

3. Result

Table (1-1) show marked increase in levels of serum CRP in adult (5.97±0.85) and elderly (6.05±0.8) groups in compare with control adult (1.99±0.46) and control elderly (2.21±0.59) groups respectively, It was found no marked differences in levels of serum CRP between adult (5.97±0.85) and elderly (6.05±0.8) groups . It was found also no marked differences in levels of serum CRP between control adult (1.99±0.46) and control elderly (2.21±0.59) groups of serum albumen between adult (3.47±0.79) and elderly (3.44±0.66) groups. It was found also no marked differences in levels of serum albumen between control adult (4.91±0.65) and control elderly (4.69±0.41) groups.

Table (1-2) show marked decrease in levels of serum albumen in adult (3.47±0.79) and elderly (3.44±0.66) groups in compare with control adult (4.91±0.65)and control elderly (4.69±0.41) groups respectively, It was found no marked differences in levels .

Table (1-3) show marked increase in levels of serum urea in adult(55.40±3.58) and elderly (68.60±3.36)groups in compare with control adult (27.73±3.22) and control elderly (31.40±4.81) groups respectively, It was found marked increase in levels of serum urea between adult(55.40±3.58) and elderly (68.60±3.36)groups. It was found also no marked differences in levels of serum urea between control adult (27.73±3.22) and control elderly (31.40±4.81) groups.

Table (1-4) show marked increase in levels of serum creatinine in adult (4.75 ±0.93) and elderly (5.04±0.97) groups in compare with control adult (0.84±0.27) and control elderly (0.95±0.23) groups respectively. It was found no marked differences in the levels of serum creatinine between adult (4.75 ±0.93) and elderly (5.04±0.97) groups. It was found also no marked differences in the levels of serum creatinine between control adult (0.84±0.27) and control elderly (0.95±0.23) group.

Table (1-5) show marked decrease in levels of serum Na in adult (133.13±5.34) and elderly (132.87 ±4.36) groups in compare with control adult

(140.13±3.11) and control elderly (137.33±2.35) groups, respectively. It was found no marked differences in the levels of serum Na between adult (133.13±5.34) and elderly (132.87 ±4.36) groups. Also it was found no marked differences in the levels of serum Na between control adult (140.13±3.11) and control elderly (137.33±2.35) groups.

Table (1-6) show marked increase in levels of serum K in adult (5.36±0.71)and elderly (5.43±0.89)groups in compare with control adult (4.32±0.60) and control elderly (4.37±0.65) groups respectively. It was found no marked differences in levels of serum K between adult (5.36±0.71)and elderly (5.43±0.89)groups. It was found also no marked differences in levels of serum K between control adult (4.32±0.60) and control elderly (4.37±0.65) groups.

Table (1-7) show marked increase in levels of serum phosphate in adult (5.44±0.69) and elderly (5.48±0.48) groups in comparison with control adult (2.55±0.38) and control elderly (2.73±0.23) groups respectively. It was found no marked differences in levels of serum phosphate between adult (5.44±0.69) and elderly (5.48±0.48) groups. It was found also no marked differences in levels of serum phosphate between control adult (2.55±0.38) and control elderly (2.73±0.23) groups.

Table (1–1): Serum C reactive protein levels for study groups

(Patients groups)	N.	(CRP mg/l) (Mean ±SD)	(Control groups)	N.	(CRP mg/l) Mean ±SD)	p. value
Adult	15	5.97±0.85	Control adult	15	1.99±0.46	0.015
Elderly	15	6.05±0.87	Control elderly	15	2.21±0.59	0.023
p. value		0.084			0.135	

(N: Number of subjects); (SD: Standard deviation).

Table (1 – 2): Serum Albumen levels for study groups

(Patients groups)	N.	(Albumin g/dl) (Mean ±SD)	(Control groups)	N.	(Albumin g/dl) (Mean ±SD)	p. value
Adult	15	3.47±0.79	Control adult	15	4.91±0.65	0.015
Elderly	15	3.44±0.66	Control elderly	15	4.69±0.41	0.023
p. value		0.845			0.467	

Legend as in table (1-1)

Table (1 – 3): Serum urea levels for study groups

(Patients groups)	N.	(Urea mg/dl) (Mean ±SD)	(Control groups)	N.	(Urea mg/dl) (Mean ±SD)	p. value
Adult	15	55.40±3.58	Control adult	15	27.73±3.22	0.002
Elderly	15	68.60±3.36	Control elderly	15	31.40±4.81	0.004
p. value		0.042			0.089	

Legend as in table (1-1)

Table (1 – 4): Serum creatinine levels for study groups

(Patients groups)	N.	(Creatinine mg/dl) (Mean ±SD)	(Control groups)	N.	(Creatinine mg/dl) (Mean ±SD)	p. value
Adult	15	4.75 ±0.93	Control adult	15	0.84±0.27	0.000
Elderly	15	5.04±0.97	Control elderly	15	0.95±0.23	0.000
p. value		0.231			0.178	

Legend as in table (1-1)

Table (1 – 5): Serum sodium levels for study groups

(Patients groups)	N.	(Sodium m mol/L) (Mean ±SD)	(Control groups)	N.	(Sodium m mol/L) (Mean ±SD)	p. value
Adult	15	133.13±5.34	Control adult	15	140.13±3.11	0.021
Elderly	15	132.87 ±4.36	Control elderly	15	137.33±2.35	0.014
p. value		0.641			0.326	

Legend as in table (1-1)

Table (1 – 6): Serum potassium levels for study groups

Patients groups	N.	(potassium mmol/L) (Mean ±SD)	(Control groups)	N.	(potassium mmol/L) (Mean ±SD)	p. value
Adult	15	5.36±0.71	Control adult	15	4.32±0.60	0.032
Elderly	15	5.43±0.89	Control elderly	15	4.37±0.65	0.027
p. value		0.782			0.912	

Legend as in table (1-1)

Table (1 – 7): Serum phosphate levels for study groups

(Patients groups)	N.	(Phosphate mg/dl) (Mean ±SD)	(Control groups)	N.	(Phosphate mg/dl) (Mean ±SD)	p. value
Adult	15	5.44±0.69	Control adult	15	2.55±0.38	0.035
Elderly	15	5.48±0.48	Control elderly	15	2.73±0.23	0.000
p. value		0.943			0.828	

Legend as in table (1-1)

Table (1-8) and figures (1-1), (1-2), (1-3), (1-4), (1-5) and (1-6) Explain the correlation between C reactive protein and other parameters in this studies .It was found positive correlation among CRP and (urea , creatinine , potassium and phosphate). It was found also negative correlation among CRP and (Albumin and sodium).

Discussion

C-reactive protein (CRP), acute phase protein excrete by the liver, is most used in clinical setting as an inflammation biomarker, and high levels of CRP is passively correlating with prognosis of diverse diseases related to inflammation (24,25).Inflammation is the centric characteristic of acute kidney injury, and it is passivelylinked with the prognosis. Emerging evidence shows that serum level of CRP acts as a risk factor for acute kidney injury and increases in acute kidney injury, and it is positively correlated with disease severity (26). Hypoalbuminemia may develop in a diversity of condition like inflammation, insufficient, infections, nutrition, oxidative stress, cancer a, protein-loss diseases and liver function disorder (27,28,29) Hypoalbuminemia usually observed among inpatient cases, is a risk factor for AKI and mortality among critical patients (30).The levels of urea in blood is influenced by protein in diet . The levels of the urea when be too much, this known " ureamia". This case is commonly as result of declan kidney function. In elderly, the level of urea might be a few higher than normal (31).Its can easily determine The loss of kidney function by measuring creatinine in the blood (32) .Creatinine varies with age and sex because the formation is constant and is direct correlation to mass of muscle (31). The level of urea and creatinine increased in the renal failure on account of reduced number of nephrons, this lead lose ability of kidney to get rid of nitrogenous waste from the blood ,as a result ,these substances accumulation in the blood (33,34). For the kidneys to excrete excess water by producing a large amount of dilute urine, there should be an adequate glomerular filtration rate. Generally, less renal impairment results from hyponatremia due to higher water intake. In contrast, hypernatraemia may result from renal water loss. The hallmark of marked renal water loss is polyuria, defined as a urine

volume greater than 3L/24 hours. The common defect in all cases of renal water loss is an inability of the kidney to conserve water appropriately (35).

Table (1-8) Correlation between C reactive protein and other parameters this studies

C reactive protein with	Adult (r)	Elderly (r)	Results
Albumin	- 0.36	-0.21	negative correlation
Urea	0.32	0.37	positive correlation
creatinine	0.18	0.23	positive correlation
Sodium	-0.16	-0.18	negative correlation
Potassium	0.29	0.25	positive correlation
Phosphate	0.17	0.19	positive correlation

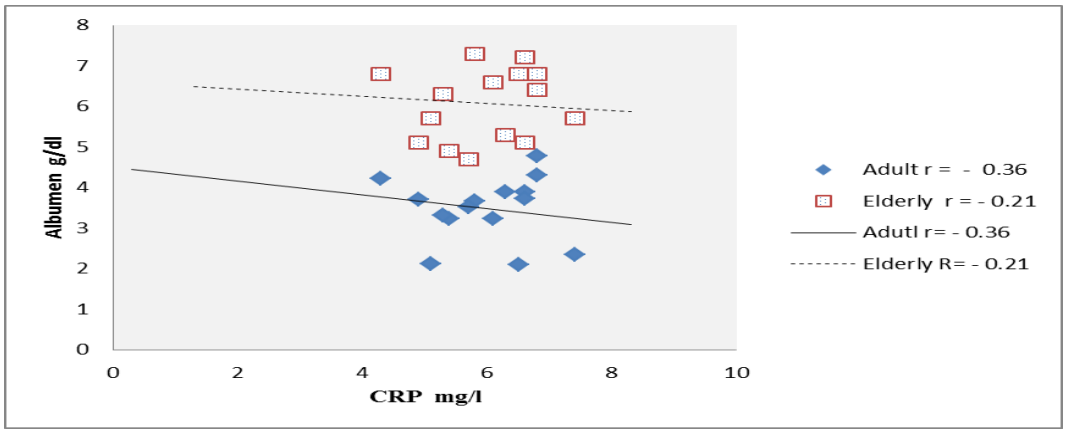

Figure (1- 1) shows the negative correlation between CRP and albumen

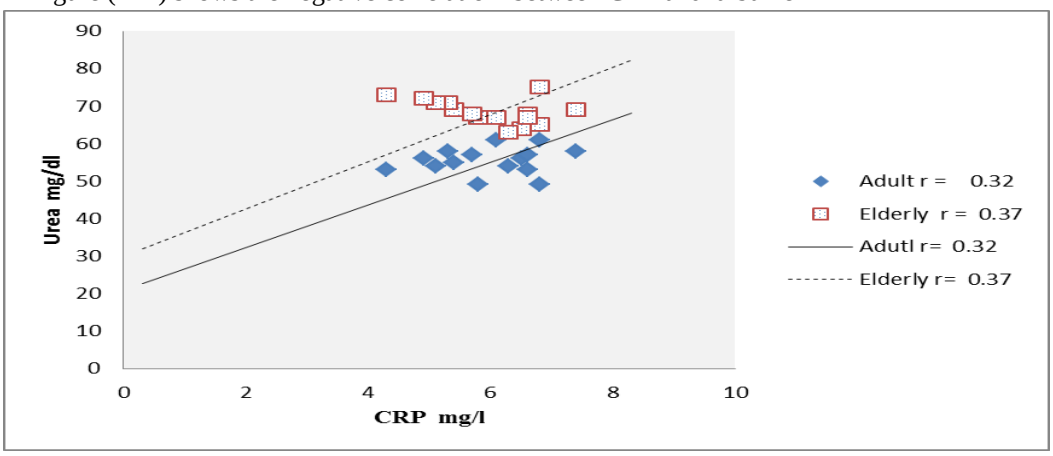

Figure (1- 2) shows the positive correlation between CRP and urea

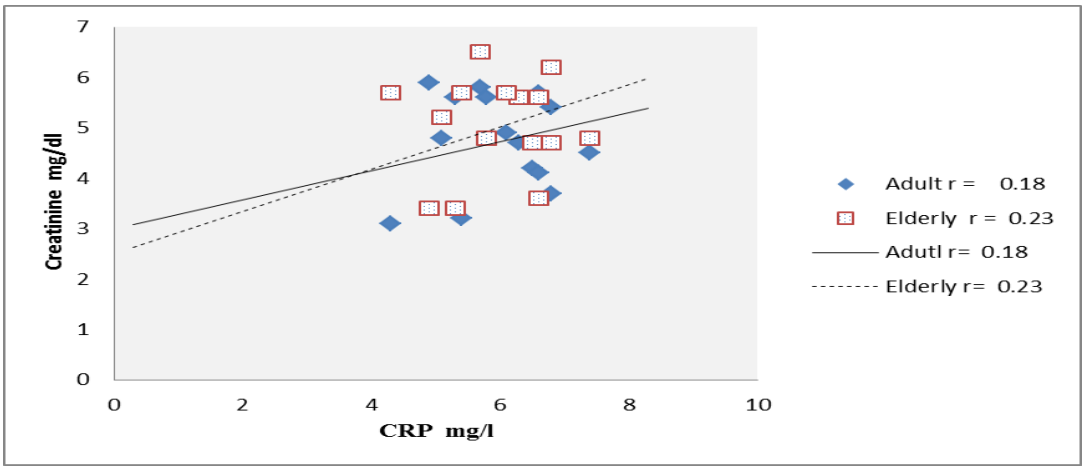

Figure (1- 3) shows the positive correlation between CRP and creatinine

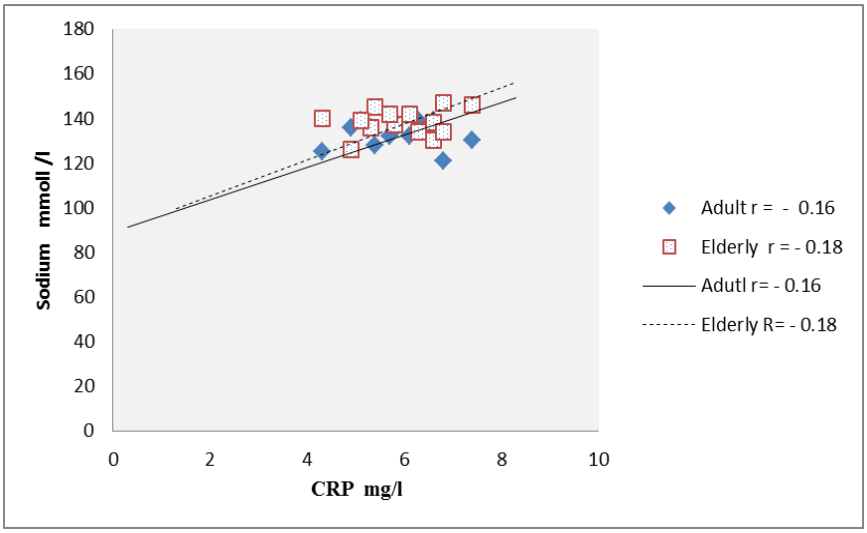

Figure (1- 4) shows the negative correlation between CRP and sodium

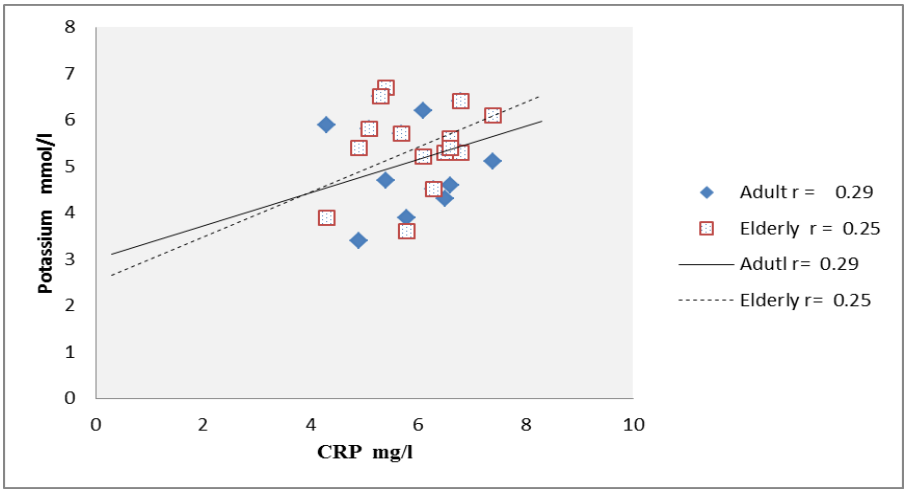

Figure (1- 5) shows the positive correlation between CRP and potassium

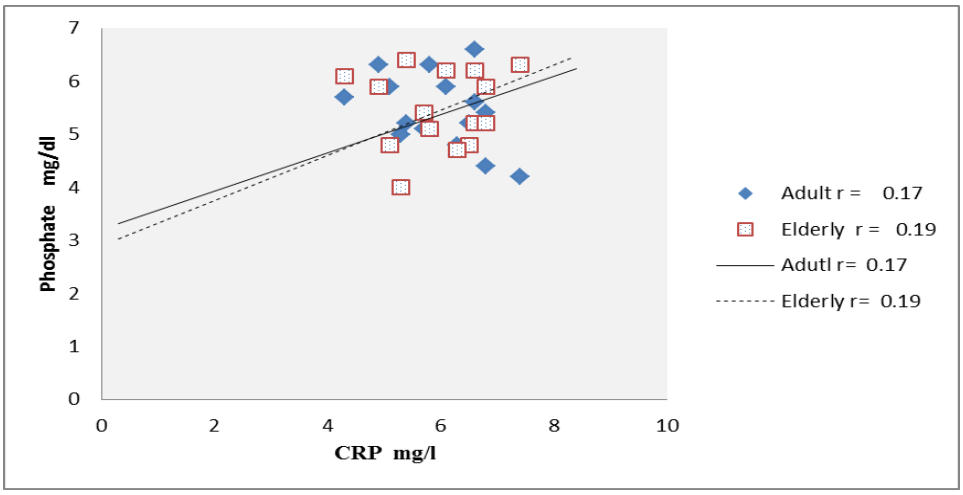

Figure (1- 6) shows the positive correlation between CRP and phosphate

Serum potassium is most convincing electrolyte marker of renal injury.The combination of decreased filtration and decreased potassium excretion in distal tubules during renal injury results in increased plasma potassium. Hyperkalemia is the most important life-threatening complication of kidney injury. (36) . one of the generality considerable hazard factors related with cardiovascular disease in chronic kidney disease patients is Hyperphosphataemia . Accurate mechanism underlying this linked remains obscure. It is think to be related to hyperparathyroidism and vascular calcification, which results from high phosphorus levelsgenerality (37). As kidney disease progresses there is reduce filtration and excretion of phosphate resulting in hyperphosphataemia (38).

5. Conclusion

It was discuss the roles of CRP in ARI , And a statement of this impact on age groups , then explain the correlation with other parameters includes (albumen , urea , creatinine , sodium , potassium and phosphate).

6. Acknowledge

Special thanks to patients with ARI for their endowment of help by donation of blood. We wish them a speedy recovery.

Ethical Clearance

Finally the ethical approval for this study was issued by the ethical committee of college of science of Thi-Qar university.

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