Effect of Hemodialysis on Serum Uric Acid, Urea, Creatinine and Albumin Level in Chronic Renal Failure Patients

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Accepted 17th November, 2016

Abstract
The aim of this study was to assess the effect of hemodialysis on serum uric acid, urea, creatinine and albumin level among CRF patients. A cross-sectional study included 50 subjects 20 female and 30 male attended to regular dialysis in police teaching hospital aged (25-80 years old) were included, timed pre and post-hemodialysis samples were collected. Serum uric acid, urea, creatinine and albumin were measured by using Mindray Bs-200, and BMI was estimated. Paired t-test analyses showed significant decrease in the mean of uric acid, urea and creatinine levels in post dialysis samples with p-value (0.00, 0.000 and 0.000) when compared to pre dialysis samples, while showed significant increase of albumin level in post dialysis samples with p-value (0.000). Person’s correlation showed positive correlation between BMI and creatinine level, and no correlation noted between change in serum albumin level and reduction in urea and creatinine. The Study concludes that, hemodialysis increase serum albumin and decrease serum uric acid, urea and creatinine level.

Keywords: Uric acid, urea, creatinine, albumin CRF, dialysis and hemodialysis.

INTRODUCTION

Chronic kidney disease (CKD) is defined as kidney disease that has been present for months to years. Chronic renal disease (CRD), chronic renal failure (CRF), and chronic renal insufficiency refer to the same condition. CKD is not a single disease. Renal diseases in Africa are more prevalent and seem to be a more severe form than in western countries. Dialysis and renal transplant are poor in Africa. In North Africa, the incidence of CKD is more than West Africa. The principal cause of CKD in Africa is due to interstitial nephritis (14-32%), glomerulonephritis (11-24%), diabetes (5-20%) and nephrosclerosis (5-25%). Obstructive or reflex nephropathy, attributed to urinary scistosomiasis is common in Egypt (7%) and Libya and southern Algeria (Barsoum, 2003). All kidney diseases progress to terminal renal failure relatively independent of the initial disease (Remuzzi et al., 2002). A primary disease leads to secondary glomerular injury and the nephron loss is clinically characterized by proteinuria and hypertension, which leads to inflammation and scarring which in turn cause renal failure and ultimately elevation in the plasma creatinine, urea and uric acid concentration and causes a gradual decline in GFR (Jacobson, 1991). End stage renal disease (ESRD) presents with water, electrolytes and menials disturbance, some of these disorders...
improved and others are continued or get worse with dialysis (Sud et al., 2014). Hemodialysis (HD) is the main treatment for patients with renal failure that are waiting for kidney transplantation or don’t allow for kidney transplantation (Dakshinamurty et al., 2002). In chronic renal failure, there is a steady and continued decrease in renal clearance or glomerular filtration rate (GFR), which leads to the gathering of urea, creatinine and other chemicals in the blood. In stage five level of serum creatinine is greater than 5.0 mg/dl in men, and greater than 4.0 mg/dl in women (Couchoud et al., 1999). Reduced kidney function is associated with a variety of biochemical abnormalities which includes serum concentration of sodium, potassium, calcium and phosphorus (Hsu and Chertow, 2000). Dialysis could lead to depletion of biologically essential substances if they are not included in the dialysate. For example, removal of water-soluble vitamins is well known and all dialysis patients are given supplements to replace dialysis losses (Wiesen et al., 2011). While data are available regarding vitamins in chronic kidney disease (CKD), little is known about the trace elements. Therefore the present study hypothesized to evaluate the effect of hemodialysis on plasma creatinine, urea, uric acid and albumin.

MATERIALS AND METHODS

In this cross-sectional study, included 50 subjects 20 female and 30 male attended to regular dialysis in police teaching hospital aged (25-80 years old) were included, timed pre and post-hemodialysis samples were collected. (5ml) vein puncture blood specimen was withdrawn. Serum was obtained by centrifugation at 3000 rpm for 5 min and stored at -20 °C till used.

Ethical considerations

The study has been approved by the local ethics committee of Al-Neelain University. All participants in the study were given their written informed consent considering the aims of the study and sample and clinical information’s were used anonymously.

Measurement of BMI

Anthropometric data including weight and height were measured thus body mass index (BMI) was defined as weight (Kg) divided by height squared (m²).

Estimation of urea

Serum level of urea was measured by using Mindray Bs-200 principle urea is hydrolyzed by urease, and ammonia product helps to turn NADH to NAD which catalysis of GLDH the decrease in absorbance is directly proportional to the concentration of urea.

Estimation of creatinine

According to the manufacture, serum level of creatinine was measured by using Mindray Bs 200 principle at an alkaline solution creatinine combines with picric acid to formed an orange red colored complex the absorbency increase is directly proportional to the concentration to the creatinine.

Estimation uric acid

By using ascorbic oxidase to eliminate the interference of ascorbic acid, the uric acid is catalyzed to produce H2O2, which oxidizethe 4-AAP to yield a colored dye of quinoneimine. The absorbency decrease is directly proportional to the concentration of uric acid.

Estimation of ALB (Albumin)

At a slightly acid pH (pH=4.2), serum albumin combines with bromcresol green to produce a glaucous complex. The absorbency increase is directly proportional to the concentration of albumin.

Statistical analysis

Data from all patients were presented as percentage and (mean±SD), difference between mean of patients and control group were considered statistically significant with p-value threshold <0.05 using independent T-test.

RESULTS

1). Demonstration of uric acid level in pre-hemodialysis patients and post-hemodialysis patients.
2). The concentration of albumin in pre and post-hemodialysis patients.

![Image of albumin concentration comparison between pre and post-hemodialysis](image)

3). Demonstration of urea and creatinine level in pre and post-hemodialysis patients.

![Image of urea and creatinine concentration comparison between pre and post-hemodialysis](image)

**DISCUSSIONS**

Hemodialysis treatment for patients with renal failure lead to depletion of urea, creatinine, and uric acid and also lead to decrease or increase in some biological substances like trace elements thus hemodialysis patients are at theoretical risk for both deficiency and accumulation of these elements, depending on dialysis impact, composition of the source water used for hemodialysis, and residual kidney function. Accordingly the study aims to evaluate the impact of hemodialysis on serum urea, creatinine, uric acid and albumin and its correlation with study variables in patients with RF. In this study when compared the level of uric acid, creatinine, urea and albumin between pre-hemodialysis patients and post-hemodialysis patients, the mean level of uric acid was 5.3mg/dL in pre-hemodialysis patients, and it was 2.7mg/dL in post-hemodialysis patients there was highly significant increase of uric acid level in pre-hemodialysis patients with p-value (0.000) this finding agreed with previous study which report that, the hemodialysis lead to decrease of uric acid in patients with renal failure(10) Also the average concentration of creatinine was 7.3mg/dL in pre-hemodialysis patients, while it was 0.9mg/dL in post-hemodialysis patients there is significant increase in creatinine level with p-value (0.000), when compared the level of creatinine between pre-hemodialysis and post-hemodialysis patients, this finding agreed with previous study which report that, the hemodialysis lead to remove of waste product like creatinine. Also this study present significant increase in urea level concentration in pre-hemodialysis patients with p-value was (0.000), this finding agreed with previous study which report that, the hemodialysis lead to remove of waste product like urea.

Also the mean concentration of albumin in pre-hemodialysis patients was 2.84mg/dL, while it was 3.24mg/dL in post-hemodialysis patient, there is significant decreased of albumin level in pre-hemodialysis patients with p-value(0.000), when compared to post-hemodialysis patients.

**CONCLUSIONS**

The study concludes serum uric acid, urea and creatinine is higher in pre-hemodialysis patients and decreased after hemodialysis, while the concentration of albumin is decreased in pre-hemodialysis patients and higher in post-hemodialysis samples.

**REFERENCES**


