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# The Comparison of serum uric acid levels in patients on hemodialysis and peritoneal dialysis

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## Abstract

***Introduction.*** Uric acid levels increase in chronic renal failure especially due to protein metabolism. In this study, we aimed to compare uric acid clearance who are also nephrotoxic in patients with end-stage renal disease.
***Methods***. Sixty-one chronic peritoneal dialysis (PD) patients and fifty-one chronic hemodialysis (HD) patients were included in the study. Clinical and laboratory characteristics of PD and HD patients were compared. Duration of PD and HD, uric acid levels, age and gender of the patients evaluated. Uric acid levels in PD patients and HD patients compared.
***Results.*** The mean ages of PD and HD patients were 56.7±13.5 and 57.2±16.4 years, respectively (p=0.864). The number of male patients was more in PD group and female in HD group (p=0.959). Duration of dialysis was 3.25 years in PD and 3.75 years in HD (p=0.925). The mean serum uric acid levels were 5.54±1.13 mg/dL in PD patients, and 5.76 ±1.52 mg/dL in HD patients (p=0.389).
***Conclusions.*** Dialysis is used to remove toxins in end-stage renal disease. Uric acid levels may be elevated in patients with end-stage renal disease. However, there was no difference in serum uric acid levels in PD and HD patients in our study.

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***Keywords:*** Hemodialysis, peritoneal dialysis, uric acid.

## Introduction

Uric acid is the final product of the diet and endogenous purine metabolism synthesized mostly in the liver. Especially, uric acid levels are especially high in 10-15% of people over 40 years. In normal healthy individuals, the upper limit of uric acid is 7-8 mg/dL in men, and 6 mg/dL in women. The reason for being low in women is that the estrogen hormone shows uricosuric effect and low muscle mass. Consumption of meat, legumes, yeast and yeast-containing foods lead to increase in uric acid. It is also found high in diabetic patients, alcohol intake, medicines (thiazide diuretics etc.), heart failure, renal failure and disease with high turnover such as cancer (leukemia, solid tumors etc.). Plasma uric acid is present in the form of Na-urate. One third of them are excreted from the gastrointestinal system and the remaining two third are excreted in the urine. The level of serum

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uric acid increases in end stage renal disease (ESRD).[1] Uric acid is removed by dialysis. Which dialysis method is more effective is controversial?

In this study, we aimed to show which dialysis method is used to remove toxic uric acid more effectively.

## Methods

*Patients*

The values of 51 hemodialysis and 61 peritoneal dialysis patients analyzed retrospectively. Age, gender, duration of dialysis, laboratory levels like uric acid evaluated. Only ESRD patients treated with hemodialysis or peritoneal dialysis analyzed. Patients who received renal replacement therapy for at least one year included in the study. The patients had been trained in nutrition. They did not receive a uric acid-lowering treatment. The average of the first and last uric acid values that recorded in the system evaluated, respectively.

*Statistical analysis*

Data analyzed using Statistical Package for the Social Sciences (SPSS) version 21 (IBM Acquires SPSS Inc., Somers, NY, USA). Descriptive statistical methods (mean, median, frequency, standard deviation, ratio) compared with Pearson Chi-square, paired t and Mann Whitney U test used to compare two groups of variables that did not show normal distribution. Differences considered significant if $p < 0.05$.

## Results

In our study, 59 patients were male and 53 were female. The gender distribution of the patients did not differ (p=0.959). The mean age of patients was 57.2±16.4 and 56.7±12.5 years in HD and PD groups, respectively. Durations of dialysis were 3.25 (1-14) and 3.75 (1.25-16) years in HD and PD groups, respectively. There was no significant difference between ages (p=0.864) and dialysis durations (p=0.925) in the patients who underwent PD and HD. The mean serum uric acid levels were 5.76±1.52 mg/dL in HD patients, and 5.54±1.13 mg/dL in PD patients. There was no difference between the mean uric acid levels of the patients in both groups (p=0.389). Other laboratory parameters were given in Table 1.

## Discussion

Uric acid is the final product of purine or nucleotides and about two out of three is excreted by the kidneys.[2,3] Chronic renal failure itself creates an inflammatory environment. In particular, the effect of toxins accumulated in the body plays a major role. Uric acid excretion decreases with increasing degree of renal failure.[4] Hyperuricemia in general population has been shown to be associated with metabolic syndrome, hypertension, peripheral and cardiovascular diseases, diabetes mellitus and chronic kidney disease.[5-10] High uric acid level increases mortality due to endothelial dysfunction, local renin angiotensin activation, oxidative stress and proinflammatory causes. Elevated serum uric acid concentration is an independent risk factor for mortality and CV risk, or it represents a surrogate marker for decreased kidney function, hypertension, and/or cardiovascular disease has been a matter of some debate. This controversy persists regarding those in the general population and patients with specific conditions such as diabetes and hypertension. Conflicting results also

**Table 1.** Laboratory parameters of the groups

| | PD (n=61) | HD (n=51) | p |
|---|---|---|---|
| Age | 56.77±12.58 | 57.25±16.45 | 0.864 |
| Gender (Male/Female) | 32/29 | 27/24 | 0.959 |
| Duration of dialysis (Year) | 3.25(1-14) | 3.75(1.25-16) | 0.925 |
| Serum uric acid (mg/dL) | 5.54±1.13 | 5.76±1.52 | 0.389 |
| Ca (mg/dL) | 8.45±1.39 | 8.34±1.27 | 0.653 |
| P (mg/dL) | 4.72±1.58 | 4.81±1.64 | 0.846 |
| Parathormone(pg/mL) | 304.8±112.4 | 289.4±105.7 | 0.885 |
| Kt/V | 1.83±0.458 | 1.58±0.25 | 0.226 |

PD: Peritoneal dialysis. HD: Hemodialysis. Ca: Calcium. P: Phosphorus.

exist regarding the role of serum uric acid level as a risk factor in patients with ESRD. Previous reports suggest that higher serum uric acid levels are related closely to other established risk factors, such as male sex, hypertension, and metabolic syndrome; thus, elevated serum uric acid concentration may contribute to increased mortality risk indirectly. Meanwhile, higher serum uric acid level may be considered a surrogate for better nutritional status, which is expected to decrease mortality in dialysis patients. There are studies describing positive and negative relationship between uric acid level and cardiovascular mortality in HD and PD patients as an independent risk factor.[11-17] Since the patients in our study were ESRD and dialysis patients, elevated uric acid levels expected in our study because our patients were end stage renal failure and underwent HD or PD. Elevated uric acid levels in these patients were due to renal dysfunction.[4] It is controversial which dialysis method is more effective. However, we have not found any studies on which dialysis form removes uric acid better.

Finally, in patients undergoing dialysis due to chronic kidney disease and ESRD, uric acid is high because it is not excreted sufficiently. It has been shown that elevated uric acid levels associated to hypertension, cardiovascular disease, diabetes mellitus and chronic kidney disease. Cardiovascular events are the most important cause of mortality in PD and HD patients. Our study described that uric acid, which shows its relationship with cardiovascular diseases, is cleaned in the same form in both dialysis types.

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