

## PAPER DETAILS

TITLE: Uric acid levels and clearance in chronic kidney disease patients

AUTHORS: Mehmet USTA,Yavuz AYAR

PAGES: 19-21

ORIGINAL PDF URL: <https://dergipark.org.tr/tr/download/article-file/944564>



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

Mehmet Usta,  Yavuz Ayar 

Nephrology Clinic, Bursa City Hospital, Bursa, Turkey

### 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  $56.7 \pm 13.5$  and  $57.2 \pm 16.4$  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  $5.54 \pm 1.13$  mg/dL in PD patients, and  $5.76 \pm 1.52$  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.

*Turk J Int Med 2020;2(1): 19-21*

**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



Received: January 17, 2020; Accepted: January 26, 2020; Published Online: January 29, 2020

#### Address for Correspondence:

Yavuz Ayar,

Nephrology Clinic, Bursa City Hospital, Bursa, Turkey

E-mail: [yavuzayar@hotmail.com](mailto:yavuzayar@hotmail.com)



uric acid increases in end stage renal disease (ESRD).<sup>1</sup> 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  $57.2 \pm 16.4$  and  $56.7 \pm 12.5$  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  $5.76 \pm 1.52$  mg/dL in HD patients, and  $5.54 \pm 1.13$  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.<sup>2,3</sup> 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.<sup>4</sup> Hyperuricemia in general population has been shown to be associated with metabolic syndrome, hypertension, peripheral and cardiovascular diseases, diabetes mellitus and chronic kidney disease.<sup>5-10</sup> 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 $\pm$ 12.58	57.25 $\pm$ 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 $\pm$ 1.13	5.76 $\pm$ 1.52	0.389
Ca (mg/dL)	8.45 $\pm$ 1.39	8.34 $\pm$ 1.27	0.653
P (mg/dL)	4.72 $\pm$ 1.58	4.81 $\pm$ 1.64	0.846
Parathormone(pg/mL)	304.8 $\pm$ 112.4	289.4 $\pm$ 105.7	0.885
Kt/V	1.83 $\pm$ 0.458	1.58 $\pm$ 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.<sup>11-17</sup> 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.<sup>4</sup> 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.

## References

- Chonchol M, Shlipak MG, Katz R, Sarnak MJ, Newman AB, Siscovick DS, Kestenbaum B, Carney JK, Fried LF. Relationship of uric acid with progression of kidney disease. *Am J Kidney Dis*. 2007 Aug;50(2):239-47.
- Harrison R. Structure and function of xanthine oxidoreductase: where are we now? *Free Radic Biol Med*. 2002 Sep 15;33(6):774-97.
- Sautin YY, Johnson RJ. Uric acid: the oxidant-antioxidant paradox. *Nucleosides Nucleotides Nucleic Acids*. 2008 Jun;27(6):608-19. doi: 10.1080/15257770802138558.
- Park C, Obi Y, Streja E, Rhee CM, Catabay CJ, Vaziri ND, Kovesdy CP, Kalantar-Zadeh K. Serum uric acid, protein intake and mortality in hemodialysis patients. *Nephrol Dial Transplant*. 2017 Oct 1;32(10):1750-7. doi: 10.1093/ndt/gfw419.
- Johnson RJ, Kang DH, Feig D, Kivlighn S, Kanellis J, Watanabe S, Tuttle KR, Rodriguez-Iturbe B, Herrera-Acosta J, Mazzali M. Is there a pathogenetic role for uric acid in hypertension and cardiovascular and renal disease? *Hypertension*. 2003 Jun;41(6):1183-90.
- Shankar A, Klein BE, Nieto FJ, Klein R. Association between serum uric acid level and peripheral arterial disease. *Atherosclerosis*. 2008 Feb;196(2):749-55.
- Jonasson T, Ohlin AK, Gottsäter A, Hultberg B, Ohlin H. Plasma homocysteine and markers for oxidative stress and inflammation in patients with coronary artery disease--a prospective randomized study of vitamin supplementation. *Clin Chem Lab Med*. 2005;43(6):628-34.
- Feig DI, Kang DH, Johnson RJ. Uric acid and cardiovascular risk. *N Engl J Med*. 2008 Oct 23;359(17):1811-21. doi: 10.1056/NEJMra0800885.
- Bandaru P, Shankar A. Association between Serum Uric Acid Levels and Diabetes Mellitus. *Int J Endocrinol*. 2011;2011:604715. doi: 10.1155/2011/604715.
- Feig DI. Uric acid: a novel mediator and marker of risk in chronic kidney disease? *Curr Opin Nephrol Hypertens*. 2009 Nov;18(6):526-30. doi: 10.1097/MNH.0b013e328330d9d0.
- Petreski T, Bevc S, Ekart R, Hojs R. Hyperuricemia and long-term survival in patients with chronic kidney disease undergoing hemodialysis. *Clin Nephrol*. 2017 Supplement 1;88(13):69-72. doi: 10.5414/CNP88FX17.
- Latif W, Karaboyas A, Tong L, Winchester JF, Arrington CJ, Pisoni RL, Marshall MR, Kleophas W, Levin NW, Sen A, Robinson BM, Saran R. Uric acid levels and all-cause and cardiovascular mortality in the hemodialysis population. *Clin J Am Soc Nephrol*. 2011 Oct;6(10):2470-7. doi: 10.2215/CJN.00670111.
- Beberashvili I, Erlich A, Azar A, Sinuani I, Feldman L, Gorelik O, Stav K, Efrati S. Longitudinal Study of Serum Uric Acid, Nutritional Status, and Mortality in Maintenance Hemodialysis Patients. *Clin J Am Soc Nephrol*. 2016 Jun 6;11(6):1015-23. doi: 10.2215/CJN.10400915.
- Hsu SP, Pai MF, Peng YS, Chiang CK, Ho TI, Hung KY. Serum uric acid levels show a 'J-shaped' association with all-cause mortality in haemodialysis patients. *Nephrol Dial Transplant*. 2004 Feb;19(2):457-62.
- Feng S, Jiang L, Shi Y, Shen H, Shi X, Jin D, Zeng Y, Wang Z. Uric acid levels and all-cause mortality in peritoneal dialysis patients. *Kidney Blood Press Res*. 2013;37(2-3):181-9. doi: 10.1159/000350143.
- Xia X, He F, Wu X, Peng F, Huang F, Yu X. Relationship between serum uric acid and all-cause and cardiovascular mortality in patients treated with peritoneal dialysis. *Am J Kidney Dis*. 2014 Aug;64(2):257-64. doi: 10.1053/j.ajkd.2013.08.027.
- Lai KJ, Kor CT, Hsieh YP. An Inverse Relationship between Hyperuricemia and Mortality in Patients Undergoing Continuous Ambulatory Peritoneal Dialysis. *J Clin Med*. 2018 Nov 5;7(11). pii:E416. doi: 10.3390/jcm7110416.

