
ORIGINAL ARTICLE**Influence of inflammation parameters on the quality of hemodialysis**

Radojica Stolic^{1}, Mirjana Pajcin², Milica Mirovic³, Tatjana Pesic³, Kristina Dugalic³, Andriana Karanovic², Kristina Bulatovic², Ivana Ilic², Milijana Relic²*

¹University of Kragujevac, Faculty of Medical Sciences, Department of Internal Medicine, Serbia,

²University of Pristina, Settled in Kosovska Mitrovica, Faculty of Medicine, Kosovska Mitrovica,

Serbia, ³University Clinical Center Kragujevac, Clinic for Nephrology and Dialysis, Department of Nephrology, Serbia

Abstract

Background: Chronic inflammation remains a persistent problem in hemodialysis patients, significantly affecting dialysis adequacy. *Aim and Objectives:* To determine the impact of inflammation parameters on the quality of hemodialysis. *Material and Methods:* The study was conducted as an observational, cross-sectional study in patients on chronic hemodialysis, including 88 patients who were dialyzed three times a week for four hours using commercially available membranes. According to the gender structure, there were 50 (56.8%) men and 38 (43.2%) women, with a mean age of 67 years. Demographic and gender structures, as well as clinical and laboratory variables that were important for the set goal, were analyzed. Dialysis adequacy was calculated using the Kt/V formula. *Results:* The results of our study showed a statistically negative correlation between body mass index and Kt/V values ($r = -0.281$), interhemodialysis yield ($r = -0.280$), urea concentration ($r = -0.217$) and creatinine ($r = -0.337$) after hemodialysis, C-reactive protein values ($r = -0.232$), β_2 microglobulin ($r = -0.469$, $p < 0.001$) and interleukin 6 ($r_s = -0.521$, $p < 0.001$). Women had statistically significantly higher Kt/V values ($p = 0.001$). *Conclusion:* Our study confirmed the negative correlation between inflammation parameters and hemodialysis adequacy index, but did not confirm the predictive significance of any parameter.

Keywords: Chronic dialysis, Inflammation, Adequacy of dialysis

Introduction

Perfect dialysis aims to result in a quality and long-term life that could be comparable to the life of people without renal failure. Regardless of the significant progress in the treatment of patients on Hemodialysis (HD), this goal is still in the realm of utopia because the search for ideal biomarkers for assessing the quality and adequacy of dialysis is without a final solution [1,2]. In practice, for many years, to assess the adequacy of HD, a dynamic model has been used to analyze the urea ratio before and after HD, which defines the dialysis dose by urea Clearance (K), dialysis Time (t), and urea distribution Volume (V). This dynamic model refers

to the formula Kt/V, proposed by Daugirdas [3]. Current guidelines recommend a target Kt/V ratio of 1.4, with a minimum of 1.2, for all patients undergoing dialysis three times a week [4].

Patients undergoing hemodialysis often have a state of chronic inflammation, which may be due to various factors such as uremic milieu, elevated levels of circulating proinflammatory cytokines, increased incidence of infections (especially vascular access for hemodialysis), protein energy loss, oxidative stress, etc. The inflammatory response is mediated by the interaction of multiple parameters, including acute-phase proteins, C-

Reactive Protein (CRP), and white blood cells. It has been confirmed that almost 35% of patients with pre-terminal renal failure have elevated CRP levels. On the other hand, 50% of patients on HD have elevated CRP values. It must be emphasized that the CRP response is not specific and that CRP values do not have absolute diagnostic value, but must be interpreted in the context of comprehensive information about each patient [5]. Given its association with CRP, interleukin-6 (IL-6) is increasingly recognized as an important mediator of the acute phase response. Although there are numerous pro- and anti-inflammatory cytokines, current data indicate that IL-6 plays a key role in the inflammatory response. Similarly, β_2 -microglobulin also indicates an exacerbation of proinflammatory processes [6,7]. However, despite the proven value of IL-6, whose values vary less than CRP levels, the question of the ideal inflammatory marker remains open [8]. Our study aimed to determine the impact of inflammation parameters on the quality of HD.

Materials and Methods

Study design and data source

The study was organized as an observational and cross-sectional study in patients with HD at the Clinic for Nephrology and Dialysis, University Clinical Center, Kragujevac, Serbia. The study included 88 patients treated with chronic HD, most often 12 hours per week, on commercially available membranes for bicarbonate dialysis and hemodiafiltration. According to the gender structure, there were 50 (56.8%) men and 38 (43.2%) women, with a mean age of 67 years, ranging from 33 to 84 years. In addition to demographic and gender structure, we recorded arteriovenous fistula positioning (distal/proximal), dialysis duration (in months), blood pump speed on the device (in ml), type of HD

(bicarbonate/hemodiafiltration), cigarette smoking, alcohol consumption, preservation of residual diuresis, blood pressure (systolic/diastolic), body mass index, yield between two dialysis sessions (ml), use of erythropoiesis stimulants, information on antibiotic use in the last year of dialysis treatment, whether dialysis was started with a dialysis catheter. We calculated the quality of dialysis using the mathematical formula Kt/V according to Daugirdas [9]. Equilibrated Kt/V was calculated from the plasma urea concentration before and after dialysis according to the second-generation logarithmic Daugirdas equation.

From the biochemical variables, leukocytes, erythrocytes, platelets, hemoglobin, urea, and creatinine, before and after dialysis, total protein, albumin, prealbumin, potassium, sodium, calcium, phosphorus, acidum uricum, ferritin, serum iron, Total Iron Binding Capacity (TIBC), Unsaturated Iron Binding Capacity (UIBC), and saturation were analyzed, along with transferrin, Gamma Glutamyl Transferase (GGT), as routine biochemical analyses, according to the annual control protocol. Also, some non-standard parameters, such as CRP, β_2 microglobulin, and IL-6, were measured.

Blood was collected in Vacutainer® tubes in the middle of the dialysis week, before dialysis. Plasma samples were stored at -20 °C. All laboratory analyses were performed by flow cytometry (Beckman Coulter Inc., Fullerton, California) or spectrophotometrically on an ILAB-600 instrument (Diamond Diagnostics—USA, 333 Fiske Street, Holliston, MA 01746), with the original reagents.

Written consent from participants was not requested because all clinical and laboratory parameters were obtained from protocol data of routine laboratory analyses. All procedures

performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study has obtained the approval from Institutional Ethics Committee.

Statistical methods

For the analysis of primary data, descriptive methods and methods for testing statistical hypotheses were used. Descriptive statistical methods were used to measure central tendency (mean and median), a measure of variability (standard deviation and range), and relative numbers. Statistical hypotheses were tested by the Student's t-test for independent samples. For analysis of the relationship, we used Pearson and Spearman correlation coefficients. For statistical analysis, we used the statistical software package SPSS 21. Statistical hypotheses were tested for a significance level of 0.05.

Results

Table 1 and Table 2 show the sociodemographic, clinical and biochemical characteristics of our

subjects. Of the 88 subjects, according to gender structure, there were 50 (56.8%) men and 38 (43.2%) women, with a mean age of 67 years, ranging from 33-84 years. More than half of the patients had proximally located fistulas, more than two-thirds were smokers and dialyzed with bicarbonate dialysis, less than half had preserved diuresis, and the mean Kt/V index indicated inadequate dialysis. The results of our study showed a statistically negative correlation between body mass index and Kt/V value ($r = -0.281$), yield between two HD ($r = -0.280$), urea concentration ($r = -0.217$) and creatinine ($r = -0.337$) after HD and CRP values ($r = -0.232$), Table 2. The results of the research showed a statistically significant connection between gender and the adequacy of HD, that is, women had statistically significantly higher values of the Kt/V index ($p = 0.001$), Table 3. Our results revealed a statistically significant negative correlation between β_2 microglobulin and the Kt/V index ($r = -0.469$, $p < 0.001$), Figure 1, and between the value of IL-6 and the Kt/V index ($r_s = -0.521$, $p < 0.001$), Figure 2.

Table 1: Baseline sociodemographic and clinical characteristics of patients (n=88)

Variables	Results
Age (years), median (range)	67 (33-84)
Gender (male/female), n (%)	50 (56.8)/38 (43.2)
AVF (distal/proximal), n (%)	42 (47.7)/46 (52.3)
Blood pump speed (ml)(ml), median (range)	250 (180-300)
Duration of HD (months), median (range)	59 (13-384)
Type of dialysis (bicarbonate/hemodiafiltration), n (%)	59 (67)/29 (33)
Smoking history (yes/no), n (%)	26 (29.9)/61 (70.1)
Alcohol consumption (yes/no), n (%)	3 (3.4)/83 (94.3)

Continued...

Residual diuresis (yes/no), n (%)	38 (44.7)/47 (55.3)
Systolic blood pressure [(mmHg), median (range)]	120 (90-150)
Diastolic blood pressure, [(mmHg), median (range)]	70 (50-90)
Body mass index [(kg/m ²), median (range)]	24.4 (17.2-42.1)
Yield between two HD (ml), median (range)	3000 (500-5000)
Use of erythropoiesis stimulators (yes/no), n (%)	79 (89.8)/9 (10.2)
Use of antibiotic therapy in the last year (yes/no), n (%)	39 (50.6)/38 (49.4)
Did HD start with a central venous catheter (yes/no), n (%)	45 (59.2)/31 (40.8)
Kt/V, $\pm$ sd	1.01 $\pm$ 0.2

Table 2: Baseline biochemical characteristics of patients (n=88)

Leukocytes (10 ⁹ /l), $\pm$ sd	6.5 $\pm$ 2
Erythrocytes (10 ¹² /l), $\pm$ sd	3.3 $\pm$ 0.4
Hemoglobin (g/l), median (range)	104 (73 - 145)
Thrombocytes (10 ⁹ /l), median (range)	182.5 (56 - 530)
Urea before HD, median (range)	19.2 (11.4 - 717)
Urea after HD, median (range)	5.7 (2.5 - 14.2)
Creatinine before HD, $\pm$ sd	748.2 $\pm$ 186.5
Creatinine after HD, $\pm$ sd	322 $\pm$ 93.3
Total protein concentration, $\pm$ sd	65.4 $\pm$ 5
Albumin concentration, median (range)	38 (30 - 44)
Prealbumin, median (range)	0.3 (0.1 - 0.5)
K, median (range)	5.2 (1.4 - 7.2)
Ca, $\pm$ sd	2.3 $\pm$ 0.2
P, median (range)	1.5 (0.6 - 3.3)
Acidum uricum, median (range)	344 (197 - 563)
Ferritin, median (range)	558.4 (44 - 1369.3)
Serum iron, median (range)	9.8 (3.1 - 25.2)
Transferrin saturation, median (range)	24.9 (5.1 - 88.7)
CRP, median (range)	5.4 (0.3 - 101.8)

Continued...

β2 microglobulin, ± sd	27.9 ± 7.3
Interleukin 6, median (range)	11.4 (1.6 - 180.4)

HD-hemodialysis; AVF-arteriovenous fistula; Kt/V-index adequacy hemodialysis; K-Potassium; Ca-Calcium; P-Phosphate; CRP-C reactive protein;

Table 3: Correlation of examined biochemical variables with the quality of hemodialysis

Variables	Kt/V (r)
Age (years)	-0.130
Length of HD (months)	0.137
Blood pump speed (ml)	-0.086
Duration of HD (months)	0.170
Systolic blood pressure (mmHg)	-0.154
Diastolic blood pressure (mmHg)	-0.093
Body mass index (kg/m²)	-0.281*
Yield between two HD (ml)	-0.280*

Table 4: Correlation of examined clinical variables with the quality of hemodialysis

Leukocytes (10⁹/l)	-0.064
Erythrocytes (10¹²/l)	-0.052
Hemoglobin (g/l)	-0.006
Thrombocytes (10⁹/l)	0.005
Urea before HD	0.002
Urea after HD	-0.217*
Creatinine before HD	-0.177
Creatinine after HD	-0.337*
Total protein concentration	-0.166
Albumin concentration	0.002
Prealbumin	0.041

Continued...

K	0.193
Ca	0.081
P	0.025
Acidum uricum	-0.195
Ferritin	-0.017
Serum iron	0.059
Transferrin saturation	0.194
CRP	-0.232*

*K-Potassium; Na-Sodium; Ca-Calcium; P-Phosphate; CRP-C reactive protein; HD-hemodialysis; *statistically significant value*

Table 5: Correlation of examined clinical variables with the quality of hemodialysis

Variables	Index Kt/V	<i>p</i>
	(± sd)	
Gender, n (%) Male Female	0.97 ± 0.17 1.0 ± 0.2	0.011*
AVF positioning, n (%) Distal Proximal	1.0 ± 0.18 0.99 ± 0.19	0.171
Type of dialysis, n (%) Bicarbonate Hemodiafiltration	0.99 ± 0.20 1.07 ± 0.16	0.065
Smoking history, n (%) Yes No	1.01 ± 0.20 1.02 ± 0.18	0.804
Alcohol consumption, n (%) Yes No	0.97 ± 0.14 1.02 ± 0.19	0.682
Residual diuresis, n (%) Yes No	1.01 ± 0.21 1.02 ± 0.16	0.879
Use of erythropoiesis stimulators, n (%) Yes No	1.02 ± 0.19 0.95 ± 0.19	0.287

Continued...

Who created AVF (nephrologist/surgeon),n (%)		
Yes	0.05 ± 0.20	0.264
No	1.0 ± 0.18	
Use of antibiotic therapy in the last year, n (%)		
Yes	0.97 ± 0.19	0.084
No	1.05 ± 0.19	
Did HD start with a central venous catheter, n (%)		
Yes	0.99 ± 0.22	0.345
No	1.03 ± 0.15	

Kt/V-index adequacy of the hemodialysis; AVF-arteriovenous fistula; HD-hemodialysis;

**statistically significant value*

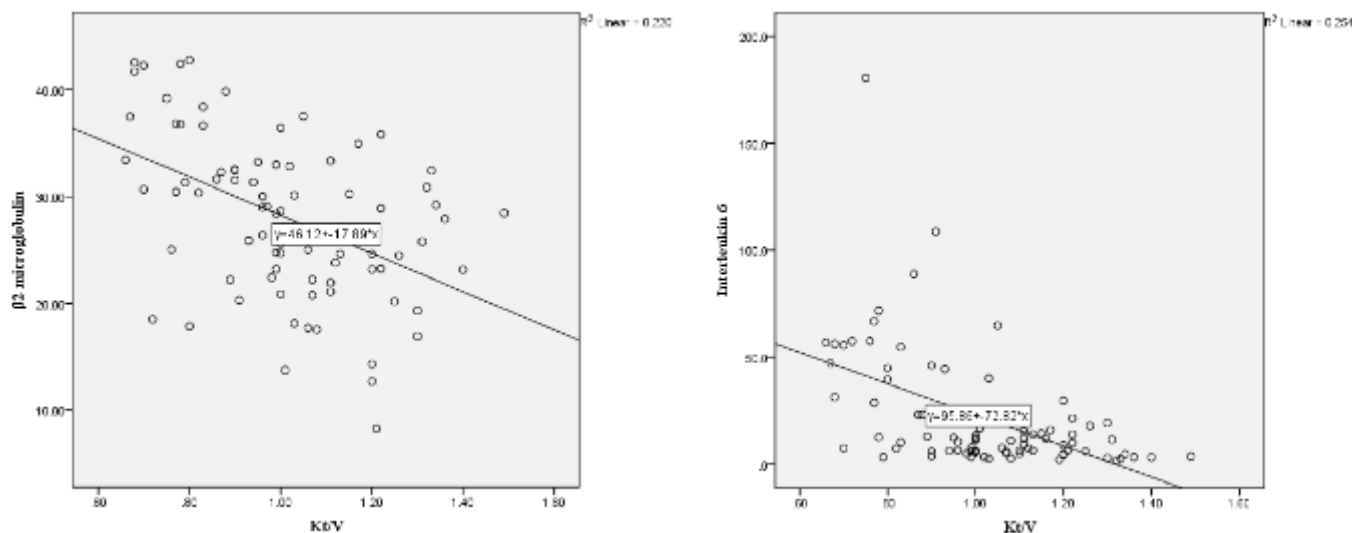


Figure 1: A statistically significant negative correlation between the Kt/V index and $\beta 2$ microglobulin ($r = -0.469$, $p < 0.001$) and IL-6 ($r = -0.521$, $p < 0.001$). In fact, higher $\beta 2$ microglobulin and IL-6 values were associated with worse HD quality.

Discussion

Dialysis adequacy has been a central issue among medical researchers since the beginning of HD, and the Kt/V index is the most commonly used measure of dialysis adequacy, which reflects the ratio of urea reduction at the end of HD [10]. Chronic uremic syndrome can trigger the synthesis of proinflammatory cytokines, which is why patients with inadequate dialysis have higher levels of inflammatory mediators. Similarly, an inverse correlation has

been found between Kt/V and CRP, a leading parameter of inflammation in serum. Elevated inflammatory markers in HD patients should prompt the search for treatable causes [11,12]. Compared with the general population, HD patients have approximately three-fold higher concentrations of proinflammatory markers (CRP and IL-6) [6]. CRP values, depending on the severity of inflammatory activity, increase in cases of tissue

damage, inflammation, and infection by 500 to 1000 times compared to normal levels [10]. The results of our study found a negative correlation between CRP and IL-6 in relation to the Kt/V index; higher CRP and IL-6 values were accompanied by lower Kt/V values, which is in line with the findings of Rashid *et al.* (2015) [11] and Borazana *et al.* (2004) [13], who confirmed that a better Kt/V index is associated with a lower degree of chronic inflammation. These findings support the fact that the quality of HD is represented by the optimal removal of uremic toxins and proinflammatory cytokines. Studies have highlighted potential gender differences in prescribing dosage and determining the quality of HD [14,15], which our results also confirmed. Specifically, we showed that HD adequacy was statistically significantly associated with gender; that is, women had significantly higher Kt/V values than men. However, in women, the Kt/V formula may overestimate dialysis clearance due to differences in urea volume of distribution [16], suggesting that urea volume of distribution is lower and Kt/V is higher in women than in men.

The Kt/V value is inversely proportional to body size and, as a result, patients with higher body mass index are more likely to have lower Kt/V values [17]. Our results showed a negative correlation between body mass index and Kt/V values; in fact, higher body mass index values were associated with lower dialysis quality.

Hypervolemia is common in dialysis patients and significantly affects the Kt/V ratio [18]. Interdialytic body weight yield is a parameter associated with fluid overload and is a common surrogate marker of dialysis adequacy [19] because it corresponds to total body water, one of the three elements that define dialysis dose. Our study

confirmed that higher body weight in patients on dialysis is accompanied by lower Kt/V ratios. Urea is used to calculate dialysis adequacy, which can be a surrogate for other uremic toxins because it is readily diffusible, making it a sensitive measure of total dialysis dose [20-22]. Similarly, creatinine is an important marker of muscle protein catabolism in HD patients, which is greatly influenced by protein intake, hydration, and overall nutritional status, as well as dialysis clearance. Dialysis dose may be a major factor in creatinine variations identified by the Kt/V index. This relationship is complex, and the accumulation of creatinine and urea in patients with a Kt/V index < 1.2 is consistent with increased uremic stress, which inevitably predisposes to a pro-oxidative and proinflammatory microenvironment [23-25]. Our results showed that creatinine, in addition to urea, was also increased in patients with inadequate dialysis. In fact, our study found a statistically significant weak negative correlation between urea and creatinine after HD and the Kt/V index. This suggests that higher values of urea and creatinine concentrations after HD are accompanied by lower quality of HD.

Kinetic data show that the mobilization of β_2 -microglobulin from the extraplasmaic to the plasmaic space, in correlation with urea, is significantly impaired, especially in high-flux HD, suggesting that the Kt/V of urea does not reflect the influence of time on the dialysis elimination of a compound with more complex kinetics than urea. Dissociation between the removal of urea and intermediate molecules between low-flux HD and hemofiltration showed that hemofiltration after 36 months reduced predialysis β_2 -microglobulin values [26]. Our results showed that the cumulative mean serum β_2 -microglobulin level was negatively correlated with the quality of dialysis, i.e., β_2 -

microglobulin was inversely proportional to adequate HD. However, these findings must be interpreted with caution, especially in the context of establishing an interaction between dialysis quality and so-called intermediate molecules, as the duration and schedule of dialysis sessions must be included in the residual renal function, ensuring the removal of intermediate molecules and protein-bound molecules not included in the Kt/V formula, such as β_2 microglobulin.

Our study had certain limitations. The study was conducted in a center where most patients did not have adequate dialysis. The sample size of our study is not large, which may limit the statistical power of the study. Dialysis adequacy is measured by the Kt/V index, which is not always an accurate

indicator of dialysis adequacy. Also, all of our patients were of Serbian nationality, so our results may not apply to other ethnic groups.

Conclusion

Our study confirmed a negative correlation between inflammation parameters and HD adequacy index. However, our study, with a multivariate model, did not confirm the predictive significance of any parameter that had statistical significance with the univariate model. We believe that the way we observed and interpreted inflammation factors and their impact on HD adequacy could be significant in further evaluating their interrelationships. Clinically, this may indicate multiple interactions and require further research.

References

1. Torreggiani M, Fois A, Njandjo L, Longhitano E, Chatrenet A, Esposito C, et al. Toward an individualized determination of dialysis adequacy: a narrative review with special emphasis on incremental hemodialysis. *Expert Rev Mol Diagn.* 2021; 21(11):1119-37.
2. Valsaraj BP, Bhat SM, Prabhu R, Dinesh N. A qualitative research on the experience of haemodialysis in South Karnataka: lived experience of persons undergoing haemodialysis. *J Krishna Inst Med Sci Univ.* 2014; 3(2):90-100.
3. Daugirdas JT. Kt/V (and especially its modifications) remains a useful measure of hemodialysis dose. *Kidney Int.* 2015; 88(3):466-73.
4. Filiopoulos V, Vlassopoulos D. Inflammatory syndrome in chronic kidney disease: pathogenesis and influence on outcomes. *Inflamm Allergy Drug Targets.* 2009; 8:369-82.
5. Sumida K, Kalantar-Zadeh K, Kovesdy CP. Inflammation in patients with kidney function impairment. In: Berns JS, Taylor EN, editors. UpToDate. Waltham (MA): UpToDate Inc.; updated 2023 Aug 29.
6. Cobo G, Lindholm B, Stenvinkel P. Chronic inflammation in end-stage renal disease and dialysis. *Nephrol Dial Transplant.* 2018; 33(Suppl 3):iii35-40.
7. Shenoy MT, Rukmini MS, Manjrekar PA, Hegde A, Akshatha LN. Serum beta2-microglobulin as a biomarker in early stages of chronic kidney disease. *J Krishna Inst Med Sci Univ.* 2021; 10(3):21-8.
8. Sahib A, Choudhury C, Wani IA, Wani MM. Evaluation of inflammatory status in chronic kidney disease patients and a comparison between hemodialysis and peritoneal dialysis patients. *Cureus.* 2024; 16(9):e69443.
9. Daugirdas JT. Second-generation logarithmic estimates of single-pool variable-volume Kt/V: an analysis of error. *J Am Soc Nephrol.* 1993; 4:1205-13.
10. Ai S, Xu Q, Chen G, Zheng K, Qin Y, Li X. Effects of hemodialysis adequacy on chronic kidney disease complications using latent class trajectory modeling: a real-world study based on long-term observation of Kt/V. *Front Med (Lausanne).* 2024; 11:1449919.
11. Rashid H, Rizwan-ul-Haq, Abad-ur-Rehman. Comparison of C-reactive protein levels with delivered dose of Kt/V in patients with end-stage renal disease on maintenance hemodialysis. *Saudi J Kidney Dis Transpl.* 2015; 26(4):692-6.
12. Kaygin MA, Halici U, Aydin A, Dag O, Binici DN, Limandal HK, et al. The relationship between arteriovenous fistula success and inflammation. *Ren Fail.* 2013; 35(8):1085-8.

13. Borazan A, Aydemir S, Sert M, Yilmaz A. The effects of hemodialysis and peritoneal dialysis on serum homocysteine and C-reactive protein levels. *Mediators Inflamm.* 2004; 13(5-6):361-4.
14. Adams SV, Rivara M, Streja E, Cheung AK, Arah OA, Kalantar-Zadeh K, et al. Sex differences in hospitalizations with maintenance hemodialysis. *J Am Soc Nephrol.* 2017; 28(9):2721-8.
15. Hecking M, Bieber BA, Ethier J, Kautzky-Willer A, Sunder-Plassmann G, Säemann MD, et al. Sex-specific differences in hemodialysis practices and the male-to-female mortality rate: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *PLoS Med.* 2014; 11(10):e1001750.
16. Spalding EM, Chandna SM, Davenport A, Farrington K. Kt/V underestimates the hemodialysis dose in women and small men. *Kidney Int.* 2008; 74(3):348-55.
17. Hong WP, Lee YJ. The association of dialysis adequacy, body mass index, and mortality among hemodialysis patients. *BMC Nephrol.* 2019; 20(1):382.
18. Raimann JG, Chan CT, Daugirdas JT, Depner T, Gotch FA, Greene T, et al. The effect of increased frequency of hemodialysis on volume-related outcomes: a secondary analysis of the Frequent Hemodialysis Network Trials. *Blood Purif.* 2016; 41(4):277-86.
19. Wystrychowski G, Levin NW. Dry weight: sine qua non of adequate dialysis. *Adv Chronic Kidney Dis.* 2007; 14(3):e10-6.
20. Rajagopalan A, Raja N, Mohan G. Dialysis adequacy: a cross-sectional study to assess the reliability of the online clearance monitor to measure dialysis dose. *Cureus.* 2024; 16(1):e52328.
21. Henning MR. Affecting Kt/V: an analysis of staff interventions. *Dial Transpl.* 2007; 36(11):584-601.
22. Mehta AN, Fenves AZ. Hemodialysis adequacy: a review. *Dial Transpl.* 2010; 39(1):20-2.
23. Silva RE, Santos EC, Justino PBI, Santos MP, Galdino G, Gonçalves RV, et al. Cytokines and chemokines systemic levels are related to dialysis adequacy and creatinine clearance in patients with end-stage renal disease undergoing hemodialysis. *Int Immunopharmacol.* 2021; 100:108154.
24. Patel SS, Molnar MZ, Tayek JA, Ix JH, Noori N, Benner D, et al. Serum creatinine as a marker of muscle mass in chronic kidney disease: results of a cross-sectional study and review of literature. *J Cachexia Sarcopenia Muscle.* 2013; 4(1):19-29.
25. Syed-Ahmed M, Narayanan M. Immune dysfunction and risk of infection in chronic kidney disease. *Adv Chronic Kidney Dis.* 2019; 26(1):8-15.
26. Vanholder R, Glorieux G, Eloot S. Once upon a time in dialysis: the last days of Kt/V? *Kidney Int.* 2015; 88(3):460-5.

***Author for Correspondence:**

Dr. Radojica V. Stolic, Svetozara Markovica 69,
Kragujevac, 34000, Serbia
Email: radojicastolic61@gmail.com
Telephone: +381658372624

How to cite this article:

Stolic R, Pajcin M, Mirovic M, Pesic T, Dugalic K,
Karanovic A, et al. Influence of inflammation
parameters on the quality of hemodialysis. *J Krishna
Inst Med Sci Univ.* 2026; 15(2):34-43

■ Submitted: 29-Dec-2025 Accepted: 12-March-2026 Published: 01-April-2026 ■