

# PATIENT TRANSFER FROM HEMODIALYSIS TO PERITONEAL DIALYSIS: A SINGLE CENTER EXPERIENCE

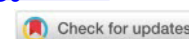
Herenda, V.<sup>1,4</sup>, Hasanspahić, S.<sup>1</sup>, Kadić, F.<sup>2,4</sup>, Hamzić-Mehmedbašić, A.<sup>1,3</sup>, Rebić, D.<sup>1,3</sup>

<sup>1</sup>Clinic for nephrology Clinical Center University of Sarajevo, Sarajevo, Bosnia and Herzegovina,  
e-mail: [vedad.herenda@gmail.com](mailto:vedad.herenda@gmail.com); [damir.rebic@gmail.com](mailto:damir.rebic@gmail.com); [hasanspahics@gmail.com](mailto:hasanspahics@gmail.com); [aida\\_mehmedbasic@yahoo.com](mailto:aida_mehmedbasic@yahoo.com);

<sup>2</sup>Internal medicine department, General hospital „Prim.dr. Abdulah Nakaš“, Sarajevo, Bosnia and Herzegovina,  
e-mail: [kadicfaris@gmail.com](mailto:kadicfaris@gmail.com)

<sup>3</sup>Medical Faculty University of Sarajevo, Sarajevo, Bosnia and Herzegovina,  
e-mail: [damir.rebic@gmail.com](mailto:damir.rebic@gmail.com); [aida\\_mehmedbasic@yahoo.com](mailto:aida_mehmedbasic@yahoo.com);

<sup>4</sup>Medical Faculty Sarajevo Sarajevo School of Science and Tehnology, e-mail: [vedad.herenda@gmail.com](mailto:vedad.herenda@gmail.com)



**Abstract:** INTRODUCTION Peritoneal dialysis and hemodialysis are complementary ways of treating end-stage renal failure. Changing the dialysis modality from hemodialysis to peritoneal dialysis is a rare and poorly studied phenomenon. MATERIALS AND METHODS Retrospective cohort study conducted on the population of adult patients with end-stage chronic renal failure who were treated at the Nephrology Clinic of the Clinical Center of the University of Sarajevo in the period from 2006 to 2023. A total of 109 adult patients, whose medical documentation was complete and who were in the peritoneal dialysis program at the Nephrology Clinic of the Clinical Center of the University of Sarajevo during the observed period, were included in this study. One group started the treatment with peritoneal dialysis, and the other with hemodialysis. Demographic data were collected for each patient: age, gender, underlying kidney disease, comorbidities (heart disease and diabetes), duration of treatment modality, data on modality change, complications and treatment outcomes. Data from physical and electronic patient histories were used. RESULTS Total of 109 adult patients were included in this study. They are divided into two groups. Group 1 (n=99) in which peritoneal dialysis was the first treatment modality and Group 2 (n=10) in which haemodialysis was the first treatment modality, but in which patients, after a certain time, were transferred to peritoneal dialysis. The median age of patients in Group 1 was 60 (-/-14.07) years and 54 (-/+12.23) years for Group 2. Within Group 1 the most common cause of terminal renal failure was diabetic nephropathy (n=40, 40.4%) and nephroangiosclerosis (n=24, 24.24%). The mean age of onset of peritoneal dialysis was 60 (-/-14.07) years, while the mean age of cessation of peritoneal dialysis was 63 ( $\pm$ 13.69) years. The average duration of peritoneal dialysis treatment was 38.36( $\pm$ 34.14) months. During the stay at peritoneal dialysis, death was recorded in 63 patients (62.38%). The number of patients who replaced peritoneal dialysis treatment with hemodialysis was 26. The most common reason for switching to haemodialysis was insufficiency of peritoneal dialysis (n=13, 14%). After switching to haemodialysis, the average length of staying on it was 10.22 months. The reason for discontinuation of haemodialysis was death (n=17, ) or transplantation (n=1, 3.7%). Kaplan-Meier test shown worse outcome in patients with haemodialysis first than peritoneal dialysis first. CONCLUSION Changing the dialysis modality carries with it a high risk of mortality, especially in the first month. Changing the way of active treatment with dialysis speaks in favor of severe comorbidities.

**Keywords:** End stage CKD, peritoneal, hemodialysis, transfer

Field: Medical Sciences and Health

## 1. INTRODUCTION

Peritoneal dialysis (PD) and hemodialysis (HD) are equally effective ways of replacing kidney function. The choice of initial replacement method depends on several factors related to the patient as well as the capabilities of the health system. There are equal advantages and disadvantages of both modalities. Numerous studies have tried to answer whether one is better than the other, but a definitive position has not yet been agreed upon. Considering the technical differences in the performance of these methods, the choice decision is more individual than general (Sun C-Y.,2020; Lobbedez T.,2005). Survival is the same with both dialysis modalities (Karen Y., 2012). Nephrologists usually start the treatment with peritoneal, and if necessary continue with hemodialysis (Chaudhary K., 2011; Yener K, 2012; Li., 2020; Nessim S.J., 2015).

A change in the dialysis method is expected in patients in the terminal stage of chronic renal failure (TBS). About 10-20% of patients per year, who initially start with peritoneal dialysis, switch to hemodialysis

<sup>†</sup>Corresponding author: [vedad.herenda@gmail.com](mailto:vedad.herenda@gmail.com)



for various reasons, most often due to technical insufficiency of PD (Chaudhary K., 2011; Dell'Aquila R., 2006; Zhang L., 2013).

The transition of patients from the hemodialysis method to peritoneal dialysis is less frequent and is mainly related to cardiac status, difficult vascular access or as a result of their own choice. In general, patient transfer from HD to PD is a rarely monitored and analyzed phenomenon in dialysis centers (Yeates K., 2012; Dell'Aquila R., 2006; Mehrotra, 20 Ahad Q., 2020).

There is a lack of data on this topic in Bosnia and Herzegovina and the region of Southeast Europe, so we do not know how many patients annually enter the peritoneal dialysis program after trying other therapeutic modalities, although it is equally represented in programs such as hemodialysis and transplantation.

Data on the length of survival after a change of modality could help us in the decision in the dilemma of switching patients to another dialysis modality.

## 2. MATERIAL AND METHODS

This is a retrospective cohort study conducted on a population of adult patients with end-stage chronic renal failure who were treated at the Clinic for Nephrology of the Clinical Center of the University of Sarajevo in the period from 2006 to 2023. One group was treated with peritoneal, and the other with hemodialysis. Data from physical and electronic patient histories were used.

The following data were collected for each patient: age, gender, underlying kidney disease, comorbidities (heart disease and diabetes), duration of treatment modality, data on modality change, complications and treatment outcomes.

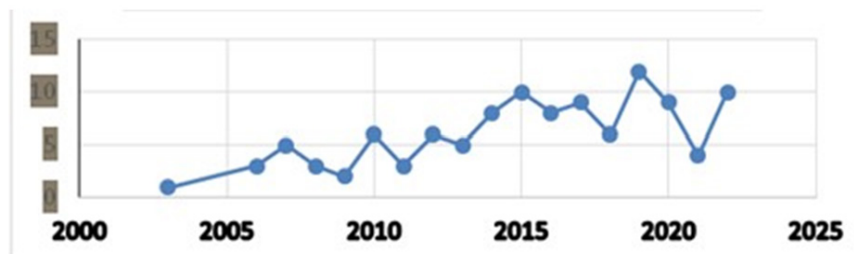
Statistical analysis was performed with the help of EasyMedStat software (version 3.24). Quantitative variables are expressed as arithmetic means with standard deviation or medians with interquartile range, depending on the distribution. To test statistical significance, t and Mann-Whitney tests were used, depending on whether they are parametric or non-parametric variables. Cox proportional hazard regression and the Kaplan-Meier curve were also used to assess survival, depending on whether they are parametric or non-parametric variables.

A total of 109 adult patients, whose medical documentation was complete and who were in the peritoneal dialysis program at the Nephrology Clinic of the Clinical Center of the University of Sarajevo during the observed period, were included in this study. They are divided into two groups. Group 1 (n=99) in which PD was the first treatment modality and Group 2 (n=10) in which HD was the first treatment modality, but in which patients, after a certain time, were transferred to PD.

## 3. RESULTS

At the Clinic for Nephrology, the incidence of patients who have peritoneal dialysis as the first treatment modality for end-stage renal failure has been increasing in recent years.

Graph 1. Incidence of patients who have PD as the first modality of treatment in Clinic for nephrology Clinical Center University of Sarajevo



The median age of patients by group was 60 (-/14.07) years for patients for whom PD was the first modality of treatment and 54 (-/+12.23) years for patients for whom HD was the first modality of treatment.

Table 1. Age of patients by the onset of dialysis

		PD first	HD first
	Frequency	99	10
Age at the moment of initiation of dialysis	Median	60	54
	Std. Deviation	14.07	12.23
	Minimum	22	34
	Maximum	80	68
Age at the moment of end of dialysis	Median	63	58
	Std. Deviation	13.69	11.77
	Minimum	30	37
	Maximum	86	69

Within Group 1 in which the first modality of treatment was PD, the most common cause of terminal renal failure was diabetic nephropathy (n=40, 40.4%) and nephroangiosclerosis (n=24, 24.24%). The mean age of onset of PD was 60 (-/14.07) years, while the mean age of cessation of PD was 63 ( $\pm$ 13.69) years.

The average duration of PD treatment was 38.36( $\pm$ 34.14) months. During the stay at PD, death was recorded in 63 patients (62.38%). The number of patients who replaced peritoneal dialysis treatment with hemodialysis was 26. The most common reason for switching to HD was PD insufficiency (n=13, 14%). After switching to HD, the average length of it was 10.22 months. The reason for discontinuation of HD was death (n=17, ) or transplantation (n=1, 3.7%)

Table 2: The most common causes of terminal renal failure

	PD first		HD first		Overall
	1	2	1	2	
	n	Percentage within group PD first	n	Percentage within group HD first	n
Nephroangiosclerosis	24	24.24%	2	20%	26
SLE	3	3.03%	2	20%	5
Nephropathia diabetica	40	40.4%	1	10%	41
VUR	1	1.01%	0	0%	1
Polycystosis renum	5	5.05%	0	0%	5
Glomerulonephritis chr.	8	8.08%	0	0%	8
Mixed tissue connective disease	1	1.01%	0	0%	1
Unknown	7	7.07%	5	50%	12
FSGS	4	4.04%	0	0%	4
Vasculitis	2	2.02%	0	0%	2
Membranoproliferative	1	1.01%	0	0%	1
Mezangioproliferative GN	1	1.01%	0	0%	1
Amiloidosis	1	1.01%	0	0%	1
ANCA vasculitis	1	1.01%	0	0%	1
Total	99	100%	10	100%	109

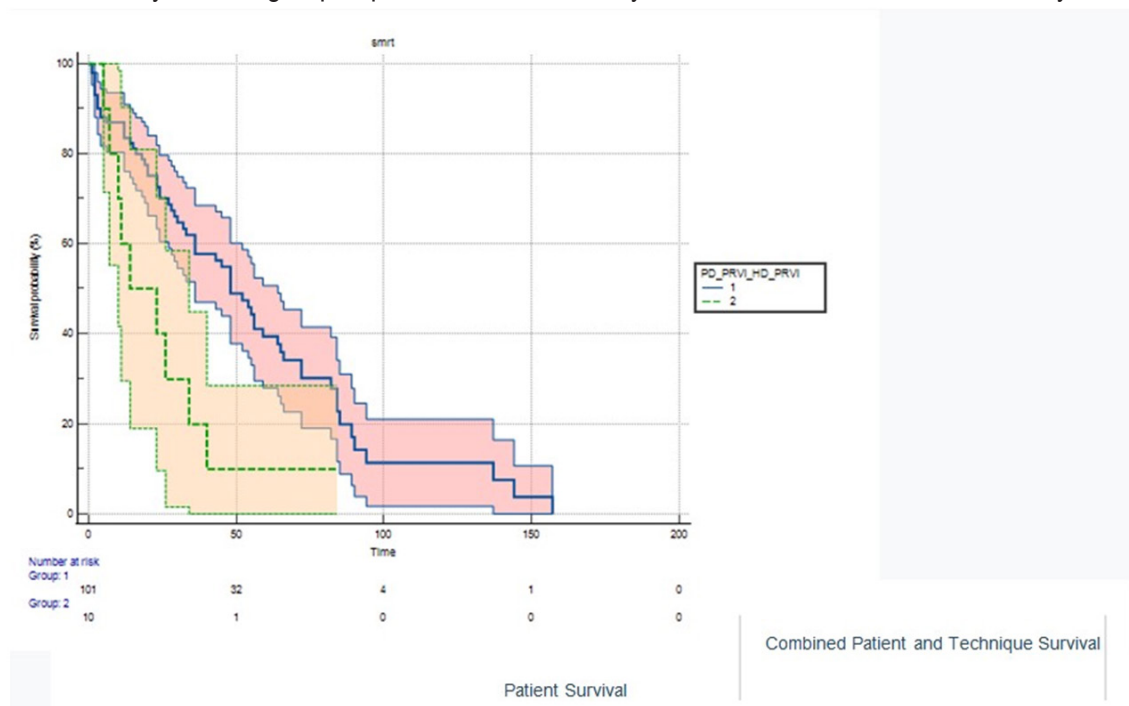
Within Group 2 in which the first treatment modality was HD, the most common cause of end-stage renal disease was unknown (n=5, 50%) followed by nephroangiosclerosis and systemic lupus erythematosus (n=2, 20%). The average age of onset of HD was 54 (22-/80) years, while the average age of stopping HD was 58 (30-/86) years.

The average duration of HD treatment was 43.5 (3-/+ 38.58) months. The most common reason for switching to PD was vascular access (n=6, 60%), followed by cardiac status (n=3, 30%) and personal choice (n=1, 10%). After switching to PD, the average length of PD, for those who stopped it, was 18 ( $\pm 23.7$ ) months. The only reason for discontinuation was death (n=9, 90%).

## SURVIVAL ANALYSIS

The cumulative follow-up time was 4309 months. The average length of follow-up of an individual patient was 37 (1/84) months. During the observed time, 71 patients died. Kidney transplantation was performed in seven patients, renal function recovered in one patient, 23 patients are on PD, and eight are on hemodialysis. In the first year of PD, 11 patients died. The Kaplan-Meier curve was used for survival analysis. A significant difference in survival was found in patients with different modalities of dialysis treatment.

Graph 2: Kaplan-Meier survival curve of the group of patients with peritoneal dialysis as the first treatment modality and the group of patients with hemodialysis as the second treatment modality



## 4.DISCUSSION

The greatest value of observational studies from different countries is that they provide valuable information about experiences, practices and techniques (Mehrotra R., 2011). This is especially evident when it comes to rarely researched topics. Research on transfer from one dialysis modality to another is rare and mainly deals with the process of transferring a patient from peritoneal dialysis to hemodialysis. The transfer in the opposite direction, of a patient from HD to PD, has not been sufficiently investigated. The indications for changing the dialysis treatment method as well as the outcomes are not well known. The results of the studies differ depending on the centers and countries, thus showing the diversity in the approach to this problem. Despite the small amount of research on this topic, researchers agree on one thing: mortality in patients who switch dialysis modalities is high. Our study is the first study of its kind in Bosnia and Herzegovina. What we found by analyzing our population of patients on peritoneal dialysis is in accordance with what was stated in advance: a large number of patients die after the transfer from HD to PD.

Peritoneal dialysis is becoming an increasingly popular form of dialysis treatment globally, and an increase in the number of patients being treated with this method is being recorded. Our center follows this trend. Survival of patients on peritoneal dialysis and hemodialysis is of the same length. Both dialysis

modalities are adequate treatment methods, the application of which will depend on several different factors. A number of studies have shown lower mortality in PD patients compared to HD patients in the first two years of treatment. This advantage is attributed to preserved residual renal function and urine volume and not to the dialysis modality itself. As residual renal function decreases, the survival advantage of PD over HD is lost.

The number of patients who continue treatment with peritoneal dialysis after HD is different from center to center. A French study showed that about 3% of HD patients annually leave HD treatment and enter a peritoneal dialysis program. (Ahad Q., 2020) Studies conducted in Poland (Dell'Aquila R., 2006; Liberek T., 2009) and Canada (Yeates K., 2012) show higher numbers. Our research showed that the number of patients who entered our PD program during the observed period is about 9% of the total PD patient population. This result can be explained by the fact that the total number of our PD patients is relatively small and that the smaller influx of new patients represents a significant statistical shift. The strikingly high mortality of this group of patients leads us to think that the transfer of patients from HD to PD should start earlier. The complementarity of dialysis modalities comes to full expression in this way, where the approach to treatment is individualized with the aim of achieving the best possible result. Mortality was highest in the first year after switching from HD to PD (Wang J., 2020). These patients have a poor outcome, which is attributed to the earlier condition, before the onset of PD (Najafi I., 2012). The length of survival on PD after HD is about 20 months according to data from different centers. (Ahad Q., 2020) In some studies, it has been reported that the length of survival of patients who switched from HD to PD is equal to that of patients who had PD as the first treatment modality (Luciano., 2023). Our results contradict the above. Our research did not establish that the length of survival was the same after changing the modality. (Liberek T., 2009)

And while in a Pakistani study mortality in the group of those transferred from HD to PD was 50% within six months of starting treatment with a new dialysis modality, our experience is different (Ahad Q., 2020). Our patients have a longer survival than in other studies, 24 months compared to 20 months. This finding is the best proof of our thesis that an earlier transfer from HD to PD might improve patient survival. The most common reason for transfer from HD to PD was the impossibility of vascular access. In second place were cardiac problems. This result correlates with the works of other authors. Changing the dialysis modality is a consequence of a change in the patient's clinical condition and always entails a complex process of adapting both the patient and his environment to the new treatment modality. In such a situation, the risk of potentially bad outcomes increases. The already sensitive patient population, with the transfer to the adaptation to the new dialysis modality, becomes even more vulnerable, which is manifested by the number of deaths in the first months of the new dialysis modality. Numerous comorbidities contribute significantly to this, so the outcome is difficult to predict. Patients who have already been on HD most often have significant cardiovascular problems: remodeling of the myocardium, advanced atherosclerosis and problems with peripheral circulation. Changing the dialysis modality, from HD to PD, may represent relief for the cardiac status, but the problem of compromised circulation still remains. In everything, the fact that the introduction of PD as a treatment method involves the capillary network of the peritoneum, which represents a new challenge for blood flow, should not be ignored.

Also, patients can start with PD after kidney graft failure after kidney transplantation (Nguyen A.N.L., 2019; Zhang X., 2008). In case of transition from PD to HD, mortality increases (3, 8, 16), and the transition itself speaks of serious comorbidities (12). The highest mortality is recorded in the first month of changing the dialysis modality, according to our results and other authors' results. And while other studies report that 10-20% of patients annually leave the PD program in order to transfer to HD, in our studied population that number is lower.

In our research, we did not find a statistically significant difference according to the gender of the respondents, in contrast to the Polish authors (Liberek T., 2009). Also, it is interesting that in the population of those who were transferred from HD to PD, there were no patients with diabetes. This finding is probably due to the small number of respondents in that group rather than the rule.

We can conclude that the change in the dialysis modality speaks of serious comorbidities and the condition of the patient who, because of them, is no longer able to continue with the originally started treatment modality. Earlier transfer of the patient from hemo to peritoneal dialysis could, due to differences in the performance of the therapeutic procedure, potentially be a positive step in improving the survival of the mentioned patients.

Limitations of this study: retrospective character and small number of subjects. The lack of medical documentation, in some cases, limited the broader analysis. However, given that this is the first study on this problem in BiH and the Western Balkan region, it provides basic information about the problem and guidelines for future research. In the future, it is necessary to conduct a multicenter prospective

randomized study in order to analyze this problem in more detail, to find more relevant conclusions and therefore potential solutions.

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