



The Comparison of the Comorbidities of Patients with Peritoneal Dialysis and Hemodialysis with the Charlson Comorbidity Index

Periton Diyalizi ve Hemodiyaliz Hastalarının Komorbiditelerinin Charlson Komorbidite İndeksi ile Karşılaştırılması

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Abstract

Aim: Hemodialysis and peritoneal dialysis are renal replacement treatment options in patients with chronic kidney disease. Mortality and morbidity rates are higher in hemodialysis and peritoneal dialysis patients when compared to the healthy population. Comorbidities of the patients play roles in the high mortality and morbidity rates. In the present study, the comorbidities of hemodialysis and peritoneal dialysis patients were evaluated; and the Charlson Comorbidity Index, whose reliability was proven in many studies before, was compared and discussed.

Material and Method: A total of 154 patients (78 hemodialysis and 76 peritoneal dialysis patients), who were followed up for end-stage renal disease, were included in the study. The Charlson Comorbidity Index scores of the patients were calculated. The Charlson Comorbidity Index score and parameters were compared between patient groups on hemodialysis and peritoneal dialysis.

Results: The Charlson Comorbidity Index was found to be significantly higher in peritoneal dialysis patients than in hemodialysis patients ($p=0.001$). It was also found that the frequency of age, congestive heart failure, cerebrovascular accident and connective tissue which are the parameters of the Charlson Comorbidity Index, were significantly different between the groups ($p<0.05$).

Conclusion: Charlson comorbidity index parameters, which may cause mortality and morbidity, were found more frequently in peritoneal dialysis patients compared to hemodialysis patients.

Keywords: Hemodialysis, peritoneal dialysis, Charlson Comorbidity Index

Öz

Amaç: Hemodiyaliz ve periton diyalizi kronik böbrek yetmezlikli hastalarda renal replasman tedavisi seçeneklerindedir. Hemodiyaliz ve periton diyalizi hastalarında sağlıklı popülasyona göre mortalite ve morbidite oranları yüksektir. Mortalite ve morbidite oranlarının yüksek olmasında hastaların sahip olduğu komorbiditelerde rol oynamaktadır. Biz bu çalışmada hemodiyaliz ve periton diyalizi hastalarının komorbiditelerini; daha önce güvenilirliği pek çok çalışma ile ispatlanmış olan Charlson Komorbidite İndeksi ile karşılaştırmayı ve tartışmayı amaçladık.

Gereç ve Yöntem: Çalışmamıza son dönem böbrek yetmezliği nedeni ile takip edilen 78 hemodiyaliz, 76 periton diyalizi hastası olmak üzere toplamda 154 hasta dahil edildi. Bu hastaların Charlson komorbidite indeksi puanları hesaplandı. Hemodiyaliz ve periton diyalizindeki hasta grupları arasında Charlson komorbidite indeksi skoru ve parametreleri karşılaştırıldı.

Bulgular: Charlson komorbidite indeksi periton diyalizi hastalarında hemodiyaliz hastalarına göre anlamlı şekilde yüksek bulundu ($p=0.001$). Gruplar arasında Charlson Komorbidite İndeksi parametrelerinden olan yaş, konjestif kalp yetmezliği, serebrovasküler olay ve konnektif bağ dokusu sıklığının anlamlı şekilde farklı olduğu görüldü ($p<0.05$).

Sonuç: Periton diyalizi yapan hastalarda hemodiyaliz hastalarına göre mortalite ve morbiditeye neden olabilecek Charlson komorbidite indeksi parametreleri sık bulunmuştur.

Anahtar Kelime: Hemodiyaliz, periton diyalizi, Charlson komorbidite indeksi



INTRODUCTION

Chronic Kidney Disease (CKD) is a disease characterized by permanent loss of kidney functions because of kidney or systemic diseases and requires cost-effective Renal Replacement Treatments (RRT). Many systems such as the cardiovascular system, musculoskeletal system, and central nervous system can be affected by the disease. When the Glomerular Filtration Rate (GFR) is <15 , it is considered as End-Stage Renal Disease and renal replacement treatments come to the forefront(1). Currently, Hemodialysis (HD), Peritoneal Dialysis (PD), and Renal Transplantation are applied as renal replacement treatments.

Mortality and morbidity rates are higher in dialysis patients (HD and PD) when compared to the healthy population. Mortality and morbidity in this patient group are closely related to the comorbidities of patients (Diabetes Mellitus (DM), Hypertension (HT), cardiovascular diseases, malignancy, etc.) (2). Knowing these comorbidities that patients have is important to decide on the appropriate dialysis modality for the patient and prevent complications that may arise.

The Charlson Comorbidity Index (CCI) was developed by Charlson et al. in 1987 as a scoring system used to classify patients' comorbidities, determine their severity, and predict their mortality. Each comorbidity of the patient has a score between 1-6 points and a total score of 0-37 is obtained in this scoring system(3). Many previous studies reported that it is a very reliable scoring system in determining the burden of disease and mortality risk(4,5).

In the present study, the purpose was to calculate and compare the comorbidity status of patients with End-Stage Renal Disease who received HD/PD as RRT using the Charlson Comorbidity Index.

MATERIAL AND METHOD

For the study, the approval of the Afyonkarahisar University of Health Sciences Ethics Committee was received on 04.11.2022 with the number 2022/546. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

A total of 154 patients, who underwent HD and PD with the diagnosis of End-Stage Renal Disease between 2016 and 2022 in Afyonkarahisar Health Sciences University Faculty of Medicine, Department of Internal Medicine, Department of Nephrology, Hemodialysis and Peritoneal Dialysis Unit, were included in the study. The patients were divided into 2 groups as HD and PD groups. The data of the patients were obtained from the hospital data system and the patients were evaluated on 19 parameters in accordance with the Charlson Comorbidity Index. The patients were given points according to the following criteria.

"1" point was given for each of the following parameters: Myocardial Infarction (past, excluding ECG changes only), Congestive Heart Failure, Peripheral Vascular Disease

(including ≥ 6 cm aortic aneurysm), Cerebrovascular Disease (SVO, TIA), Dementia, Chronic lung disease, Connective tissue disease, Peptic ulcer, Mild liver disease (including chronic hepatitis), no target organ damage Diabetes Mellitus organ uncomplicated (except only those controlled by diet).

"2" points for each of the following parameters: Hemiplegia, Moderate or severe kidney disease, Diabetes Mellitus with target organ damage, non-metastatic tumor (not included if 5 years have passed since diagnosis), Leukemia (acute or chronic), Lymphoma.

"3" points were given in case of moderate or severe liver disease.

"6" points were given for each parameter in case of metastatic solid tumor or AIDS (only HIV-positive patients are not scored).

Regardless of these parameters, "1" point was given to the total score for each decade after the age of 40, and the total scores of the patients were then calculated. The age, gender, cause of chronic renal failure, and calculated CCI were compared in HD and PD patients.

Statistical Analysis

The categorical variables were presented as frequency and percentage. The Chi-Square Test was used when comparing the categorical variables between the groups. The conformity of the continuous variables to the normal distribution was checked with the Shapiro-Wilk Test. Continuous variables were expressed as mean and standard deviation if they were normally distributed, and as median and minimum-maximum if they were not normally distributed. The Independent Sample t-Test was used for the continuous variable comparison between groups. Statistical analyzes were performed with the SPSS 26.0 (IBM Corp. 2019 IBM SPSS Statistics for Windows, version 26.0. Armonk, NY: IBM Corp.) program. A $p < 0.05$ value was taken as the statistical significance level.

RESULTS

The study was conducted with 154 End-Stage Renal Disease patients. HD was initiated in 78 (50.6%) of the patients who were included in the study and PD was initiated in 76 (49.4%). The mean dialysis time was 5 (1-7) years in HD patients and 4 (1-6) years in PD patients. Although 90 (58.4%) of the patients were female, 64 (41.6%) were male. The mean age was 59.8 ± 12.2 years. It was found that the patients who started PD were significantly older than the patients who started HD ($p=0.036$), and their BMI was significantly higher ($p=0.012$). Hypertension was the most common cause of CKD in the HD group and diabetes was the most common cause of CKD in the PD group. The CKD etiologies of the groups were found to be significantly different from each other ($p=0.012$). The comparison of demographic characteristics of HD and PD patients is given in **Table 1**.

Table 1. The Comparison of the Demographic Characteristics of HD and PD patients

Characteristics	HD (n= 78)	PD (n= 76)	p
Age (Mean±SD)	57.76±12.4	61.87±11.7	0.036
Dialysis time(year)(min-max)	5 (1-7)	4 (1-6)	0.259
Gender			
Male (%-n)	34.6-27	48.7-37	0.102
Female (%-n)	65.4-51	51.3-39	
Smoking (%-n)	32.1-25	39.5-30	0.401
Alcohol (%-n)	9-7	14.5-11	0.324
BMI (kg/m2)	24.18±3.4	26.1±5.7	0.012
CKD Etiology			
DM (%-n)	34.6-27	47.4-36	0.012
HT (%-n)	41-32	21.1-16	
Cr. Glomerulonephritis (%-n)	16.7-13	10.5-8	
Polycystic Kidney (%-n)	6.4-5	9.2-7	
Obstructive (%-n)	1.3-1	7.9-6	
Unknown	0	3.9-3	
DM (%-n)	43.6-34	52.6-40	0.333
HT (%-n)	85.9-67	75-57	0.105
HL (%-n)	17.9-14	28.9-22	0.129
Myocardial infarct (%-n)	25.6-20	40.8-31	0.060
Congestive heart failure (%-n)	20.5-16	39.5-30	0.013
Peripheral vascular disease (%-n)	11.5-9	15.8-12	0.488
Cerebrovascular disease (%-n)	6.4-5	19.7-15	0.017
Dementia (%-n)	6.4-5	14.5-11	0.119
COPD (%-n)	9-7	19.7-15	0.067
Connective tissue disease (%-n)	0	7.9-6	0.013
Peptic ulcer (%-n)	10.3-8	13.2-10	0.623
Chronic liver disease (%-n)	1.3-1	2.6-2	0.618
Hemiplegia (%-n)	1.3-1	5.3-4	0.207
Solid organ malignity (%-n)	7.7-6	7.9-6	1
Leukemia (%-n)	0	1.3-1	0.494
Lymphoma (%-n)	0	3.9-3	0.118
AIDS (%-n)	0	0	NS

BMI: body mass index, CKD: Chronic kidney disease, DM: diabetes mellitus, HT: hypertension, HL: hyperlipidemia, COPD: chronic obstructive pulmonary disease, AIDS: Acquired Immune Deficiency Syndrome KC

When the groups were compared in terms of the Charlson Comorbidity Index parameters, it was found that congestive age, heart failure, cerebrovascular disease, and connective tissue disease were statistically and significantly higher in the PD group (**Table 1**).

The mean Charlson Comorbidity Index score of the HD group was 5.9 ± 2.1 and the mean Charlson Comorbidity Index score of the PD group was 7.17 ± 2.6 . When the groups were compared in terms of the mean Charlson Comorbidity Indices, it was found that the PD group had a statistically and significantly higher Charlson Comorbidity Index score ($p=0.001$). **Figure 1** shows the comparison of the mean Charlson Comorbidity Indices of the HD and PD groups.

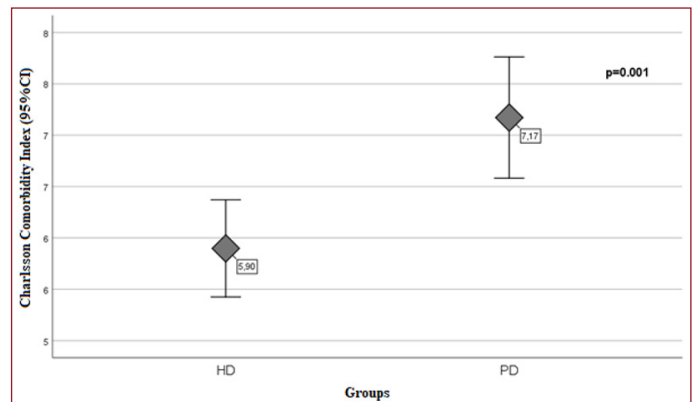


Figure 1. The Comparison of the Mean Charlson Comorbidity Indices of HD and PD Patients. HD: Hemodialysis PD: Peritoneal dialysis

DISCUSSION

Chronic kidney disease is an important public healthcare issue that can lead to systemic complications with increasing frequency. Renal replacement treatments come to the forefront when the GFR rate falls below 15. Diseases such as DM and HT are the leading causes in the etiology of CRF in patients receiving HD and PD treatment. According to the report published by the Turkish Society of Nephrology in 2020, 36.46% DM and 26.5% HT are responsible for the etiology of CRF in patients who have HD in Turkey. In patients with PD, 27.45% HT plays the first role in etiology, and it comes second with 24.28% DM (6). According to the findings of the present study, HT and DM are responsible for the etiology of CRF in HD patients, respectively, and DM and HT are the first two in etiology in PD patients, respectively. No statistical differences were detected between the patient groups in terms of DM and HT.

The Charlson Comorbidity Index is a scoring system that determines the comorbidities of patients and scores them according to the severity of their comorbidities. Previous studies showed that it can be used reliably as an indicator of morbidity and mortality(7,8). In a study that evaluated patients followed in the Intensive Care Units because of Coronavirus-19, it was shown that a 1-point increase in CCI increased mortality by approximately 32% (7). In the current study, CCI was compared in HD and PD patients. Although the CCI score was 7.17 in PD patients, it was 5.90 in HD patients. The CCI score in PD patients was statistically and significantly higher than in HD patients ($p=0.001$). The reason for the difference in CCI in the current study was that the parameters of age, congestive heart failure, connective tissue disease and cerebrovascular disease showed a statistically significant difference in PD patients when compared to HD patients. No statistical differences were detected between HD and PD groups in terms of myocardial infarction, peripheral vascular disease, dementia, Chronic Obstructive Pulmonary Disease, peptic ulcer, chronic liver disease, hemiplegia, solid organ malignancy, leukemia, lymphoma, and AIDS in other parameters of CCI.

According to the data of the Turkish Society of Nephrology, in Turkey at the end of 2020; There are a total of 60,558 patients receiving HD treatment and a total of 3,387 patients receiving PD treatment. Approximately 66.62% of HD patients and approximately 57.31% of PD patients are between the ages of 45-74(6). In our study, the mean age was; 57.76 in HD patients, 61.87 in PD patients. In our study, PD patients were older than HD patients; It may be related to the fact that it is an option for RRT that can be applied at home in immobile patients and in elderly patients where transport may be difficult.

Congestive Heart Failure (CHF) is very common in patients who receive hemodialysis and peritoneal dialysis as renal replacement treatment and is one of the leading causes of mortality in these patient groups. Approximately 30% of hemodialysis patients were found to have heart failure in a study that involved multicenter dialysis centers in the United States(9). Approximately 29.8% of patients who received HD and PD had CHF in the current study. There are different results in the literature regarding the frequency of heart failure in HD and PD patients. In a study conducted by Chien-Yao Sun et al. with 4754 HD and PD patients, the cumulative incidence of CHF was found to be significantly higher in HD patients than in PD patients (10). Patients who received HD and PD as Renal Replacement Treatment (RRT) were divided into 4 groups in another study in terms of treatment duration after their ages were equalized, and Left Ventricular Hypertrophy (LVH) and Ejection Fractions (EF) of the patients were compared. Long-term HD (U-HD: 165.1±52.7 months), short-term HD (F-HD: 71.3±28.9 months), long-term PD (U-PD: 76.5±13.2 months), short-term PD (F -SAPD:28.41±1.9 months) LVH ratio and EF were found to be lower in long-term PD patients when compared to other groups (11). In the current study, when compared to HD patients, HF was significantly higher in PD patients. This can be associated with dialysis time the volume load. In our study, the mean dialysis time of HD patients was 60 months, while the mean dialysis time of PD patients was 48 months, and there was no statistical difference between the two groups. Although there is a survival advantage over HD in the first months of PD in previous studies, this situation decreases especially after 2 years(12).Although a more effective volume control is expected compared to HD as the residual renal functions are preserved in PD patients between both treatment options, it becomes difficult to control hypervolemia in PD patients with the decreased residual kidney functions and urine output over time for PD patients. In a study conducted by Menon et al., it was shown that there is a deterioration in the volume status and an increase in blood pressure with the decrease of RRF in PD patients (13). Ultrafiltration is expected to be followed up regularly by the physician in each session and to occur effectively in HD patients.

Cerebrovascular events are the most common disease group among neurological diseases and are the third most common cause of mortality on a global scale (14). Regardless

of the type of renal replacement, it was reported that the frequency of CVO in patients with the end-stage renal disease increases 4 to 10 times when compared to the general population (15). In a study conducted by Kebapçioğlu et al. with 30 HD, 40 PD, and 50 control group patients, it was shown that ischemic stroke is significantly higher in HD-PD patients when compared to the control group. In the same study, no differences were detected between the HD and PD groups in terms of the frequency of ischemic stroke (14). In a study conducted by Wang et al. with HD and PD patients, it was determined that patients with hemorrhagic and ischemic stroke have similar risk factors (16). In the current study, cerebrovascular diseases were found to be higher in PD patients when compared to HD patients ($p=0.017$). Conditions such as DM, HT, HL, and gender, which may pose a risk for SVO, were found to be similar between the groups. This difference may be associated with the increased excretion of albumin in dialysate and the increased synthesis of some coagulation factors in PD patients, which may predispose to a thrombophilic state. Martins et al. reported that the risk of thrombosis increased in the group that underwent PD as pre-transplant RRT compared to the group that underwent HD(17).

Connective tissue diseases are a group of autoimmune diseases with involvement of other organs rich in skin, joint, and connective tissue such as systemic lupus erythematosus, Sjögren's Syndrome, polymyositis, and dermatomyositis. There is no study in the literature on the frequency of these patients in HD and PD patients. In the current study, these diseases were found to be statistically higher in the PD group than in the HD group ($p=0.017$).

CONCLUSION

In conclusion, there is no statistically significant difference between the dialysis times of PD and HD patients in our study. CCI scores were found to be significantly higher in PD patients compared to HD patients. However, there is a need for multicenter prospective studies in which the number of patients is higher and mortality data are included.

ETHICAL DECLARATIONS

Ethics Committee Approval: For the study, the approval of the Afyonkarahisar University of Health Sciences Ethics Committee was received on 04.11.2022 with the number 2022/546.

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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