Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i17.2827

COMPARISON OF PATIENT SURVIVAL BETWEEN HEMODIALYSIS AND PERITONEAL DIALYSIS AMONG PATIENTS ELIGIBLE FOR BOTH MODALITIES

Khalid[1], Arooba Naeem[2], Annum Riaz Ahmed[3], Khushal Khan[4], Mohammad Eyan Khan[5], Basit Ali[6], Faizan Banaras[7]*

[1]Postgraduate Resident Nephrology division Khyber Teaching Hospital, Peshawar
[2]Postgraduate Resident, Nephrology division Khyber Teaching Hospital, Peshawar
[3]Postgraduate Resident, Nephrology division Khyber Teaching Hospital, Peshawar
[4]House Officer, Khyber Teaching Hospital, Peshawar
[5]House Officer, Khyber Teaching Hospital, Peshawar
[6]House Officer, Nephrology division Khyber Teaching Hospital, Peshawar
[7]*Postgraduate Resident Nephrology division, Khyber Teaching Hospital, Peshawar

***Corresponding Author:** Faizan Banaras
*Postgraduate Resident, Nephrology division Khyber Teaching Hospital, Peshawar PAK
Email: faizanbanaras958@gmail.com

Abstract

Background and Aim: In recent years, as the world faces a rising prevalence of chronic diseases, such as chronic kidney disease (CKD), there has been a growing focus on evaluating health outcomes related to different dialysis methods. This study includes examining the comparative survival outcomes between peritoneal dialysis (PD) and hemodialysis (HD).

Patients and Methods: A total of 856 hemodialysis and 286 peritoneal hemodialysis adult patients were investigated in the Department of Nephrology, Khyber Teaching Hospital, Peshawar from March 2022 to April 2023. All the patients diagnosed of end-stage renal disease successfully undergone a comprehensive modality assessment were included. Hemodialysis and peritoneal dialysis were the predictors for mortality from any causes as an outcome.

Results: A total of 1142 end-stage renal disease patients including 856 hemodialysis and 286 peritoneal hemodialysis were investigated. The overall mean age of HD and PD patients was 62.5±6.8 years and 60.4±8.56 years respectively. In general, individuals with HD (hemodialysis) exhibited advanced age and a greater prevalence of causes such as hypertension, diabetes, cerebrovascular disease, coronary artery disease, malignancy, congestive heart failure, and peripheral vascular disease. We observed a significant interaction between age and dialysis approach (P = 0.01), along with a time-dependent connection between dialysis method and survival. For the elderly population (aged <65and ≥65 years), there was no statistically notable contrast in overall mortality rates between HD and PD.

Conclusion: Hemodialysis (HD) and peritoneal dialysis (PD) show comparable mortality rates in newly initiated dialysis patients fulfilling both the treatment options. The later preferred by patients having satisfactory financial status.

Keywords: Hemodialysis, peritoneal hemodialysis, survival rate, Mortality

INTRODUCTION

The onset of end-stage renal disease (ESRD) typically results in a swift decline in health unless renal replacement therapy (RRT) is initiated promptly. For the majority of adult patients, this involves undergoing dialysis treatment. There are two primary methods of dialysis: hemodialysis and peritoneal dialysis. These modalities vary both in their technical aspects and the level of patient involvement required. The population of patients in need of ongoing dialysis treatment continues to grow [1]. The selection of a specific dialysis method has become a crucial decision, as it not only impacts the allocation of resources for renal replacement therapy programs but also plays a significant role in determining the quality of life and survival of patients [2, 3]. While there is substantial evidence available regarding survival rates in dialysis, the matter of whether there is a survival difference between various dialysis modes remains a contentious topic [4-8]. Many of these studies define their primary outcome as all-cause mortality, which encompasses all deaths within the study group, without distinguishing specific causes of death [9, 10]. In general, such approaches are less informative when it comes to estimating the prognosis of chronic kidney disease (CKD) patients undergoing dialysis therapy [11].

In survival analysis, when the focus is on examining deaths related to specific causes, challenges can arise from issues such as determining the cause of death for a patient, dealing with multiple causes of death within a cohort, or the complexity of attributing death to a single cause [12]. In addressing these concerns, the techniques employed in relative survival analysis can directly assess the excess mortality of a patient group with a particular disease compared to the mortality experienced by the general population. This approach allows for the estimation of net survival [13]. Numerous observational studies have been conducted to compare peritoneal dialysis (PD) and hemodialysis (HD) in this context, yielding varied and inconclusive findings [14-16]. Therefore, this study includes examining the comparative survival outcomes between peritoneal dialysis (PD) and hemodialysis (HD).

METHODOLOGY

A total of 856 hemodialysis and 286 peritoneal hemodialysis adult patients were investigated in the Department of Nephrology, Khyber Teaching Hospital, Peshawar Pakistan from March 2022 to April 2023. All the patients diagnosed of end-stage renal disease who had undergone at least one outpatient dialysis session and had successfully undergone a comprehensive modality assessment were included. Hemodialysis and peritoneal dialysis were the predictors for mortality from any causes as an outcome. Data components comprise comprehensive details regarding demographic factors, concurrent medical conditions, laboratory measurements, the prior course of pre-dialysis medical attention, and the urgency of initiating dialysis treatment. The system records all alterations in dialysis techniques, hospital admissions, procedures involving vascular access, transplant surgeries, patients who are no longer under observation, individuals transferred out of the program, and instances of mortality. Distinct groups of patients: (1) conventional cohort, (2) eligible cohort, and (3) eligible outpatient cohort.

SPSS version 26 was used for descriptive statistics. The frequency was documented for categorical variables, while for numerical variables, the mean ± standard deviation or median with range was reported as suitable. Survival techniques were employed to examine mortality disparities based on dialysis mode within the three distinct groups. Interaction terms were retained exclusively when they demonstrated significance at a threshold of $P < 0.05$.

RESULTS

A total of 1142 end-stage renal disease patients including 856 hemodialysis and 286 peritoneal hemodialysis were investigated. The overall mean age of HD and PD patients was 62.5±6.8 years and 60.4±8.56 years respectively. . In general, individuals with HD (hemodialysis) exhibited advanced age and a greater prevalence of causes such as hypertension, diabetes, cerebrovascular disease, coronary artery disease, malignancy, congestive heart failure, and peripheral vascular disease. We observed a significant interaction between age and dialysis approach (P = 0.01), along with a time-dependent connection between dialysis method and survival. For the elderly population (aged <65 and ≥65 years), there was no statistically notable contrast in overall mortality rates between HD and PD. Demographic details and baseline characteristics are shown in Table-I. Survival information concerning different groups are shown in Table-II. Table-III displays the hazard ratios representing the adjusted risk of mortality for peritoneal dialysis compared to hemodialysis.

Table-I Demographic details and baseline characteristics of HD and PD patients

Variables	Hemodialysis patients (N=856)	Peritoneal Patients (N=286)
Age (years) [Mean ± SD]	62.5±6.8	60.4±8.56
Gender N (%)		
Male	522 (61%)	166 (58%)
Female	334 (39%)	120 (42%)
BMI (Kg/m2)	23.6	23.9
Educational status		
Illiterate	76 (8.9%)	24 (8.4%)
Educated	780 (91.1%)	262 (91.6%)
Causes of chronic Kidney diseases		
Diabetes	330 (38.6%)	136 (47.6%)
Hypertension	214 (25%)	68 (23.8%)
Obstructive	70 (8.2%)	12 (4.2%)
Polycystic kidney disease	26 (3.0%)	6 (2.1%)
Tubulointerstitial	14 (1.6%)	3 (1.0%)
Glomerular	68 (7.9%)	28 (9.8%)
Pyelonephritis	9 (1.1%)	3 (1.0%)
Laboratory parameters		
Hemoglobin, g/dL	10.3 [8.7-11.9]	11.4 [10.1-12.7]
Albumin (g/dL)	3.9 [3.4-4.2]	3.6 [3.1-4.0]
Lymphocyte count	2538 [1760-3780]	2665 [1900-4350]
Ferritin (ng/mL)	318 [154.5-585.6]	301.2 [151-560]
Comorbidities		
Diabetes	402 (47%)	148 (51.7%)
Hypertension	652 (76.2%)	228 (79.7%)
Ischemic cardiovascular disease	112 (13.1%)	34 (11.9%)
Cerebrovascular disease	36 (4.2%)	12 (4.2%)
Heart failure	124 (14.5%)	40 (14%)

Table-II Survival information concerning different groups

	Conventional cohort	Eligible cohort	Eligible outpatient cohort
Event Rate in HD	0.63	0.46	0.39
Event Rate in PD	0.41	0.37	0.32
Unadjusted $HR_{PD:HD}$ (CI=95%)	0.57 (0.45-0.74)	0.77 (0.59-0.99)	0.81 (0.59-1.10)
Adjusted $HR_{PD:HD}$ (CI=95%)	Ref	1.07 (0.80-1.41)	1.20 (0.84-1.64.5)

Table-III: hazard ratios representing the adjusted risk of mortality for peritoneal dialysis compared to hemodialysis

Adjusted Risk	Hazard ratio (HR)
Traditional Age (<65 years)	0.60
Traditional Age (>65 years)	0.91
Eligible	1.07
Eligible Outpatients	1.21

DISCUSSION:

The present study mainly reported Hemodialysis (HD) and peritoneal dialysis (PD) showing comparable mortality rates in newly initiated dialysis patients who qualify for both treatment options. The health results of individuals undergoing long-term dialysis have demonstrated enhancement throughout the previous seven decades [16, 17]. Nevertheless, in relation to survival results, there remains significant room for improvement. Patients on chronic dialysis, alongside the broader populace, may face potential hazards linked to their way of life, surroundings, unforeseen incidents, and various factors that can contribute to a decline in their health condition. Only a limited number of research studies have tackled the challenge of comparing survival rates in dialysis patients with those in the general population without chronic kidney disease (CKD) [18].

The present investigation compared hemodialysis (HD) and peritoneal dialysis (PD) and made an effort to enhance comparability between the two groups by exclusively considering patients who were considered suitable for PD after a comprehensive multidisciplinary evaluation. Initially, we observed no disparity in survival between the two treatment modalities among patients aged 70 years or older. However, within the traditional cohort, our analysis revealed that PD was correlated with a reduced risk of mortality among younger patients.

Our analysis mainly focused on the association of dialysis modalities with patient survival among those who fulfilled the both HD and PD eligible criteria. Up to dates, there is no specific research conducted regarding these correlation. Ideally, studies should focus on this specific population [19]. Unfortunately, most registries lack data regarding eligibility. In our investigation, we determined PD eligibility using a systematic approach that underwent centralized review to increase translucency. Individuals without going through dialysis modality and ineligible for PD were considered to have higher comorbidities and older age [20].

An earlier study estimated the prevalence of eligible PD patients reported varied range from 64% to 83% in newly diagnosed dialysis patients [21]. Consequently, a significant role in the underlying differences in patient characteristics of PD and HD patients was played by PD eligibility. The subset of patients ineligible for PD may inherently have a poorer prognosis, and their inclusion in previous analyses could have led to biased findings [22].

Another research study calculated both global and net survival rates within a cohort of prevalent chronic dialysis patients, comparing them with the expected survival rates in the general population. An important distinction emerged concerning survival when comparing the dialysis population with the reference population not on dialysis. Notably, statistically significant disparities were identified in terms of net survival between hemodialysis (HD) and peritoneal dialysis (PD). Net survival proved to be higher in HD patients compared to those on PD, indicating an advantage for the HD group. There is a pressing need for additional studies to address the issue of imbalance between these two patient populations and the resulting challenge of confounding factors [23].

Other findings indicate that peritoneal dialysis (PD) patients experienced consistently lower mortality risk throughout the initial two years following the start of dialysis treatment, despite variations in the censoring of transplantations and a higher likelihood of switching dialysis

modalities among PD patients [24]. A study conducted by Xu et al. [25] proposed that the reduced risk of death observed in PD patients might be attributed to sicker individuals, who did not receive prior nephrologist care, being more inclined to initiate hemodialysis (HD). This could potentially explain the higher mortality rate observed among HD patients during the early stages of dialysis. Although we lacked reliable data on pre-dialysis nephrology care, our results from the MSM (marginal structural model) analysis did not reveal a significantly different trend in terms of early survival advantage within the first 6-12 months.

CONCLUSION

Hemodialysis (HD) and peritoneal dialysis (PD) show comparable mortality rates in newly initiated dialysis patients fulfilling both the treatment options. Moreover, the survival rate showed no variation and effect on dialysis modality with time. . The later preferred by patients having satisfactory financial status.

REFERENCES

1. Thiery A, Séverac F, Hannedouche T, et al. Survival advantage of planned haemodialysis over peritoneal dialysis: a cohort study. Nephrol Dial Transplant. 2018;33(8):1411-1419.
2. Zhou H, Sim JJ, Bhandari SK, et al. Early mortality among peritoneal dialysis and hemodialysis patients who transitioned with an optimal outpatient start. Kidney Int Rep. 2019;4(2):275-284. doi:10.1016/j.ekir.2018.10.008.
3. Sandoval C. Association between type of dialysis and survival in patients with chronic renal disease in Colombia. Analysis with Marginal Structural Models; 2017.
4. Foster BJ, Laskin BL, Mitsnefes MM, Dahhou M, Zhang X. Changes in excess mortality from end stage renal disease in the United States from 1995 to 2013. Clin J Am Soc Nephrol. 2017;13(1):91-99.
5. Okuyama A, Shibata A, Nishimoto H. Critical points for interpreting patients' survival rate using cancer registries: a literature review. J Epidemiol. 2017;28(2):61-66.
6. Wong B, Ravani P, Oliver MJ, Holroyd-Leduc J, Venturato L, Garg AX, Quinn RR. Comparison of patient survival between hemodialysis and peritoneal dialysis among patients eligible for both modalities. American Journal of Kidney Diseases. 2018 Mar 1;71(3):344-51.
7. Noordzij M, Krediet RT. Choice of Hemodialysis or Peritoneal Dialysis for Kidney Replacement Therapy. Evidence-Based Nephrology. 2022 Dec 2;1:671-80.
8. Gong Y, Zhao Y, Ran L, Liu Y. Comparison Between Hemodialysis and Peritoneal Dialysis in the Risks for Disease Activity in LN-ESRD Patients: A Systematic Review and Meta-analysis. Alternative Therapies in Health & Medicine. 2022 Sep 1;28(6).
9. Kuo G, Chen JJ, Cheng YL, Fan PC, Lee CC, Chang CH. Comparison between peritoneal dialysis and hemodialysis on kidney function recovery in incident kidney failure: A nationwide cohort study. InSeminars in Dialysis 2022 May (Vol. 35, No. 3, pp. 278-286).
10. Shukri A, Mettang T, Scheckel B, Schellartz I, Simic D, Scholten N, Müller M, Stock S. Hemodialysis and Peritoneal Dialysis in Germany from a Health Economic View—A Propensity Score Matched Analysis. International journal of environmental research and public health. 2022 Oct 27;19(21):14007.
11. Noordzij M, Blake PG. Patient Survival Comparisons Between Peritoneal Dialysis and Hemodialysis. InNolph and Gokal's Textbook of Peritoneal Dialysis 2023 Mar 21 (pp. 47-62). Cham: Springer International Publishing.
12. Zazzeroni L, Pasquinellia G, Nannib E, Cremoninib V, Rubbib I. Comparison of quality of life in patients undergoing hemodialysis and peritoneal dialysis: a systematic review and meta-analysis. Kidney Blood Press Res. 2017;42:717–27.
13. van de Luijtgaarden MW, Jager KJ, Segelmark M, et al. Trends in dialysis modality choice and related patient survival in the ERA-EDTA registry over a 20-year period. Nephrol Dial Transplant. 2016;31:120–8.

14. Elsayed ME, Morris AD, Li X, Browne LD, Stack AG. Propensity score matched mortality comparisons of peritoneal and in-centre haemodialysis: systematic review and meta-analysis. Nephrol Dial Transplant. 2020; in press.
15. Levey AS, Eckardt KU, Dorman NM, et al. Nomenclature for kidney function and disease: report of a kidney disease: improving Global Outcomes (KDIGO) Consensus Conference. Kidney Int. 2020; 97(6): 1117-1129.
16. Lee YJ, Okuda Y, Sy J, et al. Ultrafiltration rate, residual kidney function, and survival among patients treated with reduced-frequency hemodialysis. Am J Kidney Dis. 2020; 75(3): 342-350.
17. Marants R, Qirjazi E, Grant CJ, Lee TY, McIntyre CW. Renal perfusion during hemodialysis: intradialytic blood flow decline and effects of dialysate cooling. J am Soc Nephrol. 2019; 30(6): 1086-1095.
18. Park JI, Park JT, Kim YL, et al. Comparison of outcomes between the incremental and thrice-weekly initiation of hemodialysis: a propensity-matched study of a prospective cohort in Korea. Nephrol Dial Transplant. 2017; 32: 355-363.
19. Xue J, Li H, Zhou Q, Wen S, Zhou Q, Chen W. Comparison of peritoneal dialysis with hemodialysis on survival of diabetic patients with end-stage kidney disease: a meta-analysis of cohort studies. Ren Fail. 2019; 41(1): 521–31. https://doi.org/10.1080/0886022X.2019.1625788.
20. Kim HJ, Park JT, Han SH, Yoo TH, Park HC, Kang SW, et al. The pattern of choosing dialysis modality and related mortality outcomes in Korea: a national population-based study. Korean J Intern Med. 2017; 32(4): 699–710. https://doi.org/10.3904/kjim.2017.141.
21. Fan L, Yang X, Chen Q, Zhang H, Wang J, Chen M, Peng H, Ni Z, Wan J, Yang H, Li Y. Burden of kidney disease among patients with peritoneal dialysis versus conventional in-centre haemodialysis: A randomised, non-inferiority trial. Peritoneal Dialysis International. 2022 May;42(3):246-58.
22. Liu H, He Z, Hu X, Li S, Wang L, Zhao D, Lin Q, Liu X, Lu F, Zhang D. Propensity-matched comparison of mortality between peritoneal dialysis and hemodialysis in patients with type 2 diabetes. International urology and nephrology. 2022 Jun 1:1-9.
23. Garcia Sierra AM. Utilization and Costs of Home Hemodialysis, In-Center Hemodialysis, and Peritoneal Dialysis Among Patients with End-Stage Renal Disease (ESRD) in the United States.
24. do Nascimento Lima H, Nerbass FB, Lugon JR, Sesso R. Characteristics and 1-year survival of incident patients on chronic peritoneal dialysis compared with hemodialysis: a large 11-year cohort study. International Urology and Nephrology. 2023 Feb 21:1-9.
25. Xu F, Yang Y, Wu M, Zhou W, Wang D, Cui W. Patients with end-stage renal disease and diabetes had similar survival rates whether they received hemodialysis or peritoneal dialysis. Therapeutic Apheresis and Dialysis. 2023 Feb;27(1):59-65.