Original Article

Clinical Characteristics, Patient and Technique Survival in Elderly Patients on Peritoneal Dialysis

Abstract

The outcomes of the elderly population on peritoneal dialysis (PD) in developing countries are less known. In this study, we intended to study the clinical characteristics and patient and technique survival of elderly patients on PD. In this study, data of 148 elderly patients with end-stage renal disease who initiated PD between January 2001 and December 2015 were collected. Baseline clinical characteristics and events during the study period were recorded. Overall patient and technique survival rates of diabetic and non-diabetic elderly patients on PD were analyzed. Around 128 patients who were initiated PD during the study period were included for final analysis. The mean age of the study group was 70.3 ± 5.1 years, and 94 (80%) were males. Among these, 79 (65.8%) had diabetes. At the end of the study period, only 20 (16.6%) patients were remained on PD. Eighty-four (70%) patients died during PD and 15 (12.5%) patients were transferred to hemodialysis during the study period. The main reasons for death were cardiovascular (56.6%) and sepsis due to peritonitis (18.8%). The mean patient survival time was 38.2 ± 2.6 months. The patient survival rates were 91.2%, 45.3%, and 22.8% at 1, 3, and 5 years, respectively. Predictors of mortality were increased serum phosphorus, peritonitis episodes, urine output <400 mL, and ultrafiltration <1000 mL/day at beginning of PD. The mean technique survival time was 92.0 ± 5.1 months. Technique survival rates at 1, 3, and 5 years were 94.8%, 85.3%, and 71.7%, respectively. None of the factors was found to be predictive of technique survival. We found no significant difference between diabetic and non-diabetic patients in terms of technique and patient survival. Mortality was higher in elderly patients on PD. Factors affecting mortality in elderly patients on PD are low urine output, low ultrafiltration at beginning of PD, high serum phosphorus, and presence of peritonitis episodes. Patient and technique survival rates were comparable between diabetic and non-diabetic elderly patients on PD.

Keywords: *Elderly patients, patient survival, peritoneal dialysis, technique survival*

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Introduction

Due to increasing life expectancy in developing countries, the number of elderly population is increasing. The increase in the number of elderly individuals in general population has translated into increase in age-related diseases such as diabetes, hypertension, cardiovascular, cerebrovascular, and renal diseases.

In kidney diseases, the increase in elderly population is reflected as more number of elderly patients reaching end-stage renal disease (ESRD) require renal replacement therapy.[1] In recent years, the number of elderly patients on renal replacement therapy had increased in developed countries. According to the United States Renal Data System, the number of elderly patients who were initiated on renal replacement therapy had increased from 7,054 in 1996 to 13,577 in 2003.[2] With the advances in medical care and technology in developing countries, the number of patients entering into renal replacement therapy is rapidly increasing. The increase in elderly patients with ESRD poses challenge to nephrologist. The optimal form of renal replacement therapy in elderly is still not clear.[3] Both medical and social issues have to be considered in providing good care to the elderly patients on renal replacement therapy. Hemodialysis may have some disadvantages in elderly such as hypotension and access-related issues due to atherosclortic arteries. The care-givers have to accompany elderly patients to dialysis unit for hemodialysis. These may be the reasons for preference of peritoneal dialysis (PD) in elderly population, which is home-based.[4]

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In France, PD is commonly used among elderly, and more than 50% of patients on PD were more than 70 years of age. In Hong Kong, among patients on PD, 44.1% of patients were more than 65 years of age. Continuous ambulatory peritoneal dialysis (CAPD) has many advantages and disadvantages in elderly population.[5] Previous studies mention that older age, female sex, and diabetes were associated with poor outcomes in patients on PD.[6,7] But some studies mention that the survival in elderly patients and diabetes have improved over the recent years.[8,9]

The optimal form of renal replacement therapy in elderly patients is still not clear. The outcomes of elderly patients on PD therapy in developing countries are less known.[10,11] The aim of this study is to analyze the characteristics and outcomes in elderly patients on PD and to find the factors predicting mortality in these patients. The study is also aimed to compare the patient and technique survival between diabetic and non-diabetic elderly patients on PD.

Materials and Methods

This study is a retrospective analysis of 148 elderly patients who had started on CAPD due to ESRD in the period between January 2001 and December 2015 in Sanjay Gandhi Post Graduate Institute, Lucknow, India. Of these, 28 patients were excluded from the study because of lack of proper data and few patients have their CAPD catheter inserted from other hospital.

Demographic characteristics of the patients were collected from patient records. Age, gender, comorbid status, basic renal disease, duration of PD, number of episodes of peritonitis, choice of PD (compulsory or patient preference), and duration of hemodialysis prior to CAPD were noted from patients' record. The mode of PD (APD vs. CAPD), daily mean ultrafiltration, and biochemical parameters such as serum creatinine, serum calcium, serum phosphorus, serum albumin, hemoglobin, and intact parathyroid hormone before and after the initiation of CAPD were noted.

The number of peritonitis episodes, time to first episode, causative organism for peritonitis, exit, and tunnel infection were recorded. Factors associated with mortality as well as patient and catheter survival were analyzed. Cause of death was ascertained mainly by hospital records from our center and by death certificates issued if the patient died elsewhere other than our hospital.

Technique failure has been defined as the need for transfer to hemodialysis for more than 2 months due to infection complications, mechanical complications, inadequate ultrafiltration or clearances.

Statistical analysis

Statistical analysis was performed using SPSS software version 11.0. Baseline characteristics were presented as mean ± standard deviation. Independent sample *t*-test was used to analyze continuous variables such as biochemical and clinical parameters. Patient and technique survival rates were calculated using Kaplan–Meier survival analysis. Predictive factors for mortality and technique failure were analyzed using Cox proportional hazard methods. Differences were considered statistically significant if *P* value is less than 0.05.

Results

Of the 764 patients who were started on CAPD during the study period, 148 (19.3%) patients were more than 65 years of age. Among these patients, 28 were excluded due to nonavailability of proper data. Seven patients were lost to follow-up in different times, but the information regarding other data was available. Data were analyzed till the last date of follow-up. In Kaplan–Meier analysis, the data were censored for survival in the date of last follow-up. The mean age of the patients was 70.3 ± 5.1 years. Among these patients, 94 (80%) were males. Patients' baseline characteristics are presented in Table 1. In comorbid diseases, diabetes was present in 79 (65.8%) patients, hypertension in 113 (94.2%), coronary artery disease in 30 (25%), and stroke in 3 (2.4%) patients.

Etiologies of ESRD were diabetic nephropathy in 75 (62.5%) patients, chronic glomerulonephritis in 9 (7.5%), chronic interstitial nephritis in 18 (15%), hypertensive nephrosclerosis in 10 (8.3%), and polycystic kidney disease in 3 (2.4%).

The mean hemodialysis duration before starting PD was 2.2 ± 3.3 months. The mean PD duration was 30.2 ± 23.5 months. Only 28 (23.3%) patients were doing PD by themselves. Most of the patients were on CAPD (93.3%) and only eight patients were on APD. Around 60.8% of patients chose PD therapy by choice, and 39.2% of patients preferred PD therapy due to arteriovenous access-related problems, hypotension during hemodialysis therapy, and intolerance to hemodialysis therapy. About 90% of these patients were doing three exchanges per day. The incidence of peritonitis was one episode per 41.2 patient-months. The incidence of exit site and tunnel infection was one episode per 43.2 patient-years. A total of 55 episodes of peritonitis were documented in 120 patients. Most of the peritonitis was culture-negative (58.1%) which was followed by *Escherichia coli* (7.2%), *Pseudomonas* (7.2%), *Candida* (5.4%), klebsiella (5.4%), and other (16.7%) infections [Table 2].

During the maximum follow-up period of 7.1 years, only 20 (16.6%) remained on PD. One patient underwent renal transplant and 15 (12.2%) patients were transferred to hemodialysis. Among the patients who were transferred to hemodialysis, 10 (66.6%) were due to peritonitis. Ninety patients (75%) died during the follow-up period. Most of the patients died due to cardiovascular events (56.6%), peritonitis (18.8%), sepsis other than peritonitis (12.2%), cerebrovascular events (4.4%), and other causes (7.7%) [Table 3].

Table 1: Baseline characteristics of elderly PD patients

Characteristics	Values *n*=120	Diabetes *n*=79	Non-diabetic *n*=41	*P*
Age	70.3±5.1	70.4±5.0	70.3±5.3	0.94
Gender				
Male	96 (80%)	65	31	0.38
Female	24 (20%)	14	10	
Comorbid diseases				
Diabetes	79 (65.8%)	-	-	-
Hypertension	113 (94.2%)	79	34	0.001
Coronary artery disease	30 (25%)	25	5	0.02
Cerebrovascular disease	3 (2.4%)	1	2	NS
Other	8 (6.6%)			
Etiology of renal disease				
Diabetic kidney disease	75 (62.5%)	NA	NA	NA
Chronic glomerulonephritis	9 (7.5%)			
Chronic interstitial nephritis	18 (15%)			
Hypertensive nephrosclerosis	10 (8.3%)			
Polycystic kidney disease	3 (2.5%)			
Others	5 (4.1%)			
HD duration before CAPD	2.2±3.3 months	2.2±3.3.4	2.2±3.0	0.9

Table 2: Characteristics related to peritoneal dialysis in elderly patients

Characteristics	Values, (frequency/ mean±SD) *n*=120	Diabetes *n*=79	Non-diabetic *n*=41	*P*
Type of PD				
CAPD	112 (93.3%)	74	5	0.8
APD	8 (6.7%)	5	3	
Decision for PD				
By choice	73 (60.8%)	45	28	0.22
Compulsory	47 (39.2%)	34	13	
Duration of PD	30.2±23.5 months	29.7±23.2	31.1±21.2	0.75
Peritonitis incidence	1 episode per 41.2 patients-months	1 episode per 48.9 patient-motnhs	1 episode per 31.9 patient-months	0.24
Catheter exit site and tunnel infection incidence	1 episode per 43.2 patient-year	1 episode per 39.16 patient-year	1 episode per 53.2 patient-year	0.55
Organism		-	-	-
Candida	3 (5.4%)			
Aspergillus	1 (1.8%)			
Citrobacter	1 (1.8%)			
E. Coli	4 (7.2%)			
MRSA	2 (3.6%)			
MSSA	1 (1.8%)			
Pseudomonas	4 (7.2%)			
Klebsiella	3 (5.4%)			
Mycobacterium	2 (3.6%)			
Streptococcus	1 (1.8%)			
Pheohypomycosis	1 (1.8%)			
Culture negative	32 (58.1%)			
Peritonitis (No of episodes)	55	36	25	0.1
Urine output at beginning of PD	412±302	392.4±253.7	452.4±379.1	0.30
Ultrafiltration at beginning of PD	1081±290	1104.4±283.6	1036.5±300.8	0.22

Table 3: Outcomes of peritoneal dialysis in elderly patients

Outcomes	All patients *n*=120	Diabetic (*n*=79)	Non-diabetic (*n*=41)	*P*
Death (6 patients died after transferring to HD)	90 (75%)	57 (72%)	33 (80.4%)	0.31
Cause of death (*n*=90)				0.65
Cardiovascular	51 (56.6%)	33 (57.8%)	18 (54.5%)	
Peritonitis	17 (18.8%)	10 (17.5%)	7 (21.2%)	
Sepsis other than peritonitis	11 (12.2%)	6 (10.5%)	5 (15.1%)	
Cerebrovascular	04 (4.4%)	2 (3.5%)	2 (6.1%)	
Others	07 (7.7%)	5 (8.7%)	2 (6.1%)	
Death with catheter	84 (70%)	53 (67%)	31 (75.6%)	0.33
Transfer to hemodialysis				
Cause of transfer to HDpermanently (*n*=15)	15 (12.5%)	9 (11.3%)	6 (14.6%)	0.5
Due to peritonitis	10 (66.6%)	6 (66.6%)	4 (66.6%)	0.71
Due to inadequate dialysis	2 (13.3%)	1 (11.1%)	1 (16.6%)	
Due to mechanical complication	3 (20%)	2 (22.2%)	1 (16.6%)	
Patient on PD treatment	20 (16.6%)	16 (20.2%)	4 (9.7%)	0.19
Patient underwent transplant	1 (0.83%)	1 (1.2%)	0	0.59

Table 4: Patient and Technique survival rates in elderly PD patientss

Year	Number of patients entering each year for analysis	Patient survival	Technique survival (death censored)
1st year	120	91.2%	94.8%
2nd year	96	58.6%	90.6%
3rd year	55	45.3%	85.3%
4th year	38	35.5%	78.1%
5th year	38	22.8%	71.7%

The mean survival time of patients was 38.2 ± 2.6 months (diabetes: 38.4 ± 3.3 and non-diabetes: 37.6 ± 4.3) based on Kaplan–Meier survival analysis. The survival rates were 91.2%, 58.6%, 45.3%, 35.5%, and 22.8% at 1, 2, 3, 4, and 5 years, respectively [Table 4]. Patient survival rates of diabetic versus non-diabetic at 1, 2, 3, 4, and 5 years were 89.3% versus 92.3%, 58.1% versus 59.7%, 47.3% versus 41.8%, 37.1% versus 32.8%, and 21.8% versus 23.9%, respectively. No significant difference in the survival rates was observed between the diabetic and non-diabetic elderly PD populations (log rank = 0.81).

Predictors of increased mortality were increased serum phosphorus (Hazard Ratio, HR 1.34), peritonitis episodes (HR 1.46), urine output <400 mL (HR 1.8), and ultrafiltration <1000 mL/day (HR 1.74) at beginning of PD.

The mean death censored technique survival duration was 92.0 ± 5.1 months based on Kaplan–Meier survival analysis. The overall technique survival rates were 94.8%, 90.6%, 85.3%, 78.1%, and 71.7%% at 1, 2, 3, 4, and 5 years, respectively. Technique survival rates of diabetic versus non-diabetic at 1, 2, 3, 4, and 5 years were 96.9% versus 90.1%, 92.2% versus 87.4%, 86.3% versus 83.3%, 79.7 versus 75.5%, and 68.5% versus 75.5%, respectively. No significant differences in technique survival rates were observed between the diabetic and non-diabetic elderly patients on PD (log rank = 0.56). None of the factors was predictive of technique survival in these patients.

Discussion

This study aimed at analyzing the clinical characteristics, survival outcomes, and predictors of mortality in elderly PD population in our center. We also compared the patient and technique survival between diabetic and non-diabetic elderly PD population.

The elderly PD population in our study accounted for 19.1% of all patients on PD in our center.

Patient survival

In our study, the mean survival time of elderly patients on PD was 38.2 ± 2.6 months. The survival rates were 91.2%, 58.6%, 45.3%, 35.5%, and 22.8% at 1, 2, 3, 4, and 5 years, respectively. This survival rate is less in comparison to a previous study by Prasad *et al*.[12] in Indian population where the mean age group of the PD population was 56 ± 10 years. In another study from north India, where the mean age group was 60.2 ± 9.2 years, the overall survival rate at 2 and 5 years was 53% and 10%, respectively. Our study included elderly population with mean age group of 70.3 ± 5.1 years having better survival rate compared with this Indian study.[11] Another study from Hong Kong, where most of the elderly people were on PD, the 2- and 5-year survival rates were 88% and 55%, respectively.[7] Our study has comparatively less survival rates than this study; probably most of the patients (39.2%) were started on PD due to access failure-related problems unlike their PD first policy. Another study from Turkey by Sakaci T *et al*.[10] regarding mortality in elderly patients on PD showed similar survival rates like our study.

In our study, 79 (65.8%) patients were diabetic. This percentage was high compared with previous studies. But this is similar to other Indian studies[11-13] where most of the patients on PD had diabetic nephropathy as the cause of ESRD. There was no significant difference in patient survival rate between elderly diabetic and non-diabetic populations in our study. The majority of the studies mentioned that patient survival is lower in diabetic patients on PD. Prasad *et al*.[12] found that patient survival was inferior in diabetic patients on PD compared with non-diabetic population. Studies done by Viglino *et al*.[14] and Zimmerman *et al*.[15] also found poor survival rates in diabetic PD population. As our study did not find any significant difference in survival rates between these two groups, diabetes should not deter renal physicians from starting PD as a form of renal replacement therapy (RRT) in elderly population.

Most of the deaths, which occurred in our study groups were due to cardiovascular (56.6%) causes and infection (31.1% Peritonitis was the cause of death in 17 patients (18.8%). There was no difference in the peritonitis rates between diabetic and nondiabetic elderly PD populations. Our study was similar to other studies in that cardiovascular causes are the most common cause of death in these patients.[11,12] Predictors of mortality in elderly patients on PD were Ultrafiltration (UF) less than 1000 mL/day at beginning of PD, urine output less than 400 mL/day, increased episodes of peritonitis, and increased serum phosphorus. In contrast to other studies,[13] age and presence of other comorbid conditions did not affect patient survival in multivariate Cox proportional hazard model.

Technique survival

The mean technique survival duration was 92.0 ± 5.1 months. The technique survival rates in our study were 94.8%, 90.6%, 85.3%, 78.1%, and 71.7% at 1, 2, 3, 4, and 5 years, respectively. There was no significant difference between technique survival rates between diabetic and non-diabetic elderly PD population. These data were consistent with other studies in literature. Our study could not find any predictive factors for technique survival in this study population. This is similar to the study done by SakacI T *et al*. in elderly patients on PD.[10]

The most common cause of technique failure in our study was due to peritonitis and the next being due to inadequate ultrafiltration. This is similar to most of the studies where peritonitis is the common cause for technique failure.[16-18] In this study, we used technique failure as a need for transfer to HD permanently. Some of the patients are reinitiated on PD successfully after catheter removal following peritonitis. The peritonitis rate in our study is lower than that reported by other studies done previously by Vikrant *et al*.[11] This may be due to improved connecting systems and proper training of the patients and relatives in our center. The relative risk of developing peritonitis was not different between diabetic and non-diabetic elderly population. This is similar to the other previously published studies which showed no difference in peritonitis and technique survival rates between diabetic and non-diabetic patients on PD.[14,19]

Even though the mortality rates are high in elderly patients on PD, these patients had good technique survival rates and comparatively equal survival rates as hemodialysis[20] as reported by one Indian study.[21] There was no difference between diabetic and non-diabetic elderly patients on PD in terms of patient and technique survival. PD can be a good option of RRT in elderly diabetic patients.

The strength of this study is that a large number of elderly patients were included. This is probably one of the Indian studies with a large number of elderly patients on PD. The limitations in our study are we did not measure the clearance and transport status in these patients. The outcomes of the patients related to clearance had not been evaluated in this study. The retrospective nature is also one of the limitations of this study.

Conclusion

Mortality in our study was higher in elderly patients on PD. Factors affecting survival in elderly patients on PD are low urine output, low mean ultrafiltration at beginning of PD, high serum phosphorus, and presence of peritonitis episodes. Patient and technique survival rates were comparable between diabetic and non-diabetic elderly patients on PD.

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Conflicts of interest

There are no conflicts of interest.

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