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Original Article

The Other Side of The Coin in Assisted Peritoneal Dialysis

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ABSTRACT

Background: Assisted peritoneal dialysis (aPD) has long been used worldwide to treat elderly and frail patients with end-stage renal disease. In developed countries, aPD is provided by health professionals, while in developing countries it is provided by family members or caregivers. The main aim of this study was to examine the quality of life (QoL) of caregivers and to investigate its impact on PD.

Methods: We included 31 patients on self-administered peritoneal dialysis and 40 patients on aPD. Patients were compared in terms of peritonitis, hospitalization, and catheter exit site infection. SF-36 questionnaire was administered to family members and caregivers assisting peritoneal dialysis and compared with the control group.

Results: When the SF-36 life scale sections of the assistants were evaluated separately, the median physical function score, median physical role difficulty score, median emotional role difficulty score, median social functioning score, median pain score, mean general health perception and total SF36 score were found to be statistically significantly lower compared to the control group (90 vs 57.5, 100 vs 0, 100 vs 16.7, 100 vs 50, 90 vs 55, 77.4 vs 47, 3020 vs 1575, $p<0.001$, $p<0.001$, $p<0.001$, $p<0.001$, $p=0.001$, $p<0.001$, $p<0.001$). There was no statistically significant difference between the groups in terms of clinical outcomes such as peritonitis, catheter exit site infection, and the need for hospitalization.

Conclusion: In developing countries, peritoneal dialysis supported by family members can be a convenient, safe, and cost-effective dialysis method. Nevertheless, it can be reasonable to establish measures and policies to enhance the quality of life of caregivers.

Keywords: Assisted peritoneal dialysis, SF-36 quality of life scale, peritonitis, peritoneal dialysis, caregiver

INTRODUCTION

The rate of chronic kidney disease among adults is increasing, leading to a higher incidence of end-stage renal disease (ESRD) requiring renal replacement therapy (1-4) (in my opinion this is better for beginning). Peritoneal dialysis (PD) is the most used type of home dialysis (1). PD requires a specific level of mobility and visual acuity, an intact peritoneum that has not been compromised by surgical intervention, and the ability to acquire and administer demanding daily medical therapy independently. When an individual's ability to engage in self-care is impaired, they may seek the assistance of a caregiver.

In assisted peritoneal dialysis (aPD), caregivers are primarily responsible for carrying out dialysis exchanges. Their daily responsibilities include managing catheter connections and dialysis solutions, configuring and operating the dialysis machine, maintaining records, monitoring the recipient's health, and coordinating care (5).

Some studies have suggested that aPD could increase the utilization of PD among patients (6-8). However, whether aPD attained comparable outcomes to self-care PD remained debatable (9). Moreover, it is crucial to consider the effects of caregiving on PD patients. Given the decreased physical and mental functioning of

assisted patients with PD, it is likely that their caregivers will have a heavy workload.

The SF-36 was developed and validated as a generic short-form instrument for measuring quality of life (QOL) domains. The SF-36 consists of eight QOL domains: PF, physical functioning; RP, physical role; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, emotional role; MH, mental health. Two summary components were constructed to summarize the physical and mental components (PCS and MCS, respectively) (10).

The aim of this study was to examine patients receiving assisted peritoneal dialysis and patients receiving self-administered peritoneal dialysis in terms of outcomes such as peritonitis, frequency of hospitalisation, reasons for hospitalisation and discontinuation of peritoneal dialysis. In addition, to investigate the effect of quality of life of the relatives of patients receiving peritoneal dialysis on these outcomes.

METHODS

Study Design and Participants

This is a multi-center retrospective study. In our study, four different groups of subjects were compared. The first group represented the assisted peritoneal dialysis patients, the second group represented the self-peritoneal dialysis patients, the third group represented the relatives of assisted peritoneal dialysis patients and the fourth group represented the control group consisting of healthy people in the community.

In this study, assisted peritoneal dialysis patients and self-administered peritoneal dialysis patients were compared in terms of frequency of peritonitis, catheter exit site infection, frequency of hospitalisation and reasons for hospitalization. The SF 36 questionnaire was administered to the helpers to determine whether changes in relatives' quality of life had any effect on these outcomes.

Since SF 36 questionnaire results may vary from community to community, SF 36 questionnaire results applied to the relatives were compared with the healthy control group obtained from the same community with similar demographic characteristics.

Height, weight, PD solutions used, number of hospitalizations, episodes of peritonitis, and laboratory findings were extracted from the initial and the last visit of patients who initiated peritoneal dialysis in two centers. The inclusion criteria for the investigation were as follows: (1) having undergone PD for at least three months, (2) being at least 18 years old, (3) not being hospitalized at the time of assessment or within the previous three weeks and (4) having no dementia or psychiatric diagnosis were all recorded from the files.

Family members and caregivers of consenting patients were recruited only if they resided with the patients and met the aforementioned criteria.

The study was approved by the Sakarya University Ethics Committee (approval number 186, 31.05. 2023) and all participants signed informed consent forms.

Questionnaire administered to caregivers.

Demographic information was collected from caregivers and family members, including age, gender, education, ethnicity, occupation, monthly household income, and relationship to the patient.

The quality of life was assessed using Version 1 of the SF-36, and scoring was carried out following the "SF-36 Health Survey Manual and Interpretation Guide" (10).

STATISTICAL ANALYSIS

The uploaded research data was analyzed using IBM SPSS 22 (IBM Statistical Package for the Social Sciences). Numbers and percentages are used to represent categorical variable descriptive statistics. To compare categorical variables using cross tables, the "Pearson Chi-Square Test" and the "Fisher Exact Test" were used. Descriptive statistics for regularly distributed data are provided as mean (±) standard deviation, and for non-normally distributed variables, as median (min-max). The normality distribution of numeric variables was determined using the "Kolmogorov-Smirnov" or "Shapiro-Wilk" tests. The "T for Independent Samples" test was used for normally distributed variables and the "Mann-Whitney U" test was used for non-normally distributed variables when comparing numerical variables between two independent groups. The p value resulting from pairwise comparisons involving three or more subgroups was corrected using the Bonferroni method. P0.05 statistical significance levels were approved.

RESULTS

Demographic characteristics, clinical and laboratory results of the patient group and the group performing aPD are presented in **Table 1**. Patients who had aPD were older ($p<0.001$). There was no statistically significant difference between the groups in terms of gender. When the groups were compared in terms of primary disease, it was found that diabetes mellitus (DM) was more common in the assisted PD group, and chronic glomerulonephritis patients were more common in the unaided PD group ($p=0.045$). Chronic heart failure (CHF) patients were more common in the aPD group ($p=0.023$). It was determined that the continuous ambulatory peritoneal dialysis (CAPD) modality was applied more in the group performing assisted PD ($p=0.016$). Both systolic and diastolic blood pressures (BP) were found to be lower in the aPD group compared to the control group (mean cyst BP 140 mmHg, median diastolic BP 80 mmHg, $p=0.036$, $p=0.001$, respectively).

Table 1. Comparison of demographic and clinical-laboratory results of patients with and without assisted peritoneal dialysis

	Self-care PD, (n=31)	Assisted PD, (n=40)	p- value
Age (years)	50.7±14.5	66.8±12	<0.001[1]
Gender, M/F (%M)	14/17 (45.2%)	19/21 (47.5%)	0.845[2]
Primary Disease, (n) **Diabetes Mellitus** **Hypertension** **Cr.GN** **PKD** **Nephrolithiasis** **Other** **Unknown**	 5 (16.1%) [a] 14 (45.2%) 3 (9.7%) [a] 2 (6.5%) 1 (3.2%) 5 (16.1%) 1 (3.2%)	 17 (42.5%) [b] 12 (30%) 0 (0%) [b] 0 (0%) 2 (5%) 5 (12.5%) 4 (2.8%)	 0.045[2]
CAD (%)	6/25 (19.4%)	16/24 (40%)	0.062[2]
CHF (%)	2/29 (6.5%)	11/29 (27.5%)	0.023[3]
PD Modality, CAPD/APD, (CAPD%)	22/9 (71%)	37/3 (92.5%)	0.016[3]
Extraneal, (%)	17/14 (54.8%)	19/21 (47.5%)	0.540[2]
Follow-up period (month)	33.2 (7-123)	14.2 (5-122)	0.003[3]
Weight (kg)	77.2±18.8	73.1±12.9	0.281[1]
Height (cm)	163 (144-187)	162.5 (146-178)	0.926[3]
SBP mmHg	154±31	140±24	0.036[1]
DBP mmHg	90 (60-130)	80 (60-120)	0.001[3]
Residual urine0 (ml)	1750 (0-4600)	1500 (150-4000)	0.673[3]
Blood urea nitrogen 0 (mg/dL)	55±12	48±18	0.045[1]
Creatinin0 (mg/dL)	5.6 (3.6-14.4)	5.3 (1.2-9.6)	0.149[3]
Uric acid0 (mg/dL)	6.8±1.1	6.1±1.7	0.031[1]
Albumin0(mg/dL)	38±4.1	34±5.3	0.001[1]
Total cholesterol 0(mg/dL)	200±52	180±47	0.080[1]
Triglycerides 0 (mg/dL)	160 (53-545)	111 (37-353)	0.005[3]
Low density lipoprotein 0 (mg/dL)	135±53	110±32	0.022[1]
High density lipoprotein 0 (mg/dL)	43 (29-78)	41 (28-69)	0.830[3]
C reactive protein 0 (mg/dL)	4 (3-36)	10.4 (0.6-106)	0.067[3]
Ferritin 0 (mg/ng)	184 (49-2139)	304 (57-1270)	0.041[3]
Haemoglobin 0 (g/dL)	10.7±1.5	10.8±1.5	0.747[1]
Platelet 0 (c/mL)	231±72	254±86	0.225[1]
C reactive protein/Albumin0	1.1 (0.7-12.5)	3.4 (0.2-29.8)	0.018[3]
Ultrafiltaration0 (ml)	1000 (200-2300)	1150 (0-2500)	0.328[3]
Blood Urea Nitrogen1(mg/dL)	48 (29-89)	42 (21-85)	0.033[3]
Creatinin1 (mg/dL)	6.7 (3.2-15.5)	5.1 (0.93-13.2)	0.003[3]
Uric acid1 (mg/dL)	6.1±1.2	5.7±1.3	0.215[1]
Albumine1	35±4.3	34±4.1	0.242[1]
Total cholesterol 1(mg/dL)	208±53	190±49	0.142[1]
Triglycerides1(mg/dL)	154 (60-473)	126 (47-325)	0.136[3]
Low density lipoprotein1 (mg/dL)	138±38	122±38	0.079[1]
High density lipoprotein1 (mg/dL)	48±11	48±15	0.933[1]
C reactive protein1	8 (3.1-36)	6.9 (0.6-196)	0.614[3]
LDH1 (U/L)	211 (39-439)	170 (22-369)	0.008[3]
Ferritin1	211 (18-1867)	313 (16-1211)	0.028[3]
White Blood Cell1	7.6 (4.5-12.2)	7.1 (4.5-18.4)	0.908[3]
Haemoglobin1	10.7±2.2	10.9±1.8	0.762[1]
Platelet 1	244±76	260±91	0.441[1]
C reactive protein/Albumin1	2.7 (0.8-12.9)	2 (0.2-63)	0.817[3]
Acute Peritonitis, E/H (I%)	2/29 (1.7%)	2/38 (5%)	0.591[4]
Residual urine1 (ml)	1200 (0-3000)	1000 (0-3500)	0.940[3]
Catheter exit site inf. E/H (E%)	4/27 (12.9%)	2/38 (5%)	0.393[4]
PD Program stop, E/H (E%)	8/23 (25.8%)	7/33 (17.5%)	0.395[2]
Hospitalization, E/H (E%)	18/13 (58.1%)	16/24 (40%)	0.131[2]
Reason for admission, (n) (N=34) **Peritonitis** **Anemia** **Catheter dysfunction** **Hypervolemia** **Other infections**	(n=18) 2 (11%) 2 (11.1%) 2 (11.1%) 5 (27.8%) 2 (11.1%)	(n=16) 2 (12.5%) 1 (6.25%) 3 (18.8%) 6 (37.5%) 4 (25%)	 0.439[2]

Cr.GN: chronic glomerulonephritis, PKD: polycystic kidney disease, CAD: coronary artery disease, CHF: congestive heart failure, PD:peritoneal dialysis, CAPD: continuous ambulatory peritoneal dialysis, APD: automated peritoneal dialysis, SBP: systolic blood pressure, DBP: diastolic blood pressure. '0': represents the values when peritoneal dialysis was first started.
'1': represents the values at the last visit.
[1]Independent samples t-test [2]Pearson Chi-Square [3]Man Whitney U test [4]Fisher's Exact Chi-Square

Patients with aPD have lower mean blood ure nitrogen (BUN), mean uric acid, mean albumin, median triglyceride, and mean low density lipoprotein (LDL) (55 vs 48 mg/dl, 6.8 vs 6.1 mg/dl, 38 vs 34 g/L, 160 vs 111 mg, respectively). (LDL, 135 vs 110 mg/dl, p=0.045, p=0.031, p=0.001, p=0.005, p=0.022). On the other

hand, the median ferritin value was higher in the aPD group (184 vs 304, p=0.041). There was no statistically significant difference between the groups in terms of clinical outcomes such as peritonitis, catheter exit site infection, the need for hospitalization, termination of the PD program and the reasons for hospitalization.

Demographic characteristics and SF-36 quality of life scale characteristics of the caregivers and control population are given in **Table 2**. There was no statistically significant difference between the groups in terms of age, gender and educational status. When the SF-36 life scale parts were evaluated separately, the median physical function score, median physical role difficulty score, median emotional role difficulty score, median social functionality score, median pain score, mean general health perception and total SF36 score were found to be statistically significantly lower (respectively). (90 vs 57.5, 100 vs 0, 100 vs 16.7, 100 vs 50, 90 vs 55, 77.4 vs 47, 3020 vs 1575, p<0.001, p<0.001, p<0.001, p<0.001, p=0.001, p <0.001, p<0.001).

DISCUSSION

As aPD is a treatment that requires the aid of a caregiver, it is critical to understand the impact of this modality on patient outcomes as well as the caregiver's quality of life. To our knowledge, this is the first study to examine patient outcomes and life quality of caregivers in aPD.

The demographic and clinical characteristics of the study population's aided and self-care categories were similar. The aPD group was older, had a higher frequency of diabetes and cardiovascular disease, and had more comorbidities than the self-care PD group. Boyer et al. showed that patients who began aPD treatment were twelve years older than those who did not (6). Lobbedez et al. reported in a French study that aPD patients were older and had more comorbidities than self-care patients (11). According to these statistics, the majority of those in need of assistance were elderly, decrepit, physically or mentally handicapped, and afflicted with multiple comorbidities.

Peritonitis rates were comparable in both the assisted and unassisted PD groups. Similarly, Xu et al. reported that patients receiving aided PD experienced similar peritonitis frequency as patients receiving self-carePD (12). Smyth et al. demonstated no link between PD support and survival without peritonitis (13). In a second RDPLF trial, Benabed et al. showed that nurse-assisted PD patients had a lower incidence of peritonitis than self-care PD patients, although family-assisted PD had no protective effect against peritoneal infection (14). Nurse support was related with an increased risk of peritonitis in automated PD patients, according to Verger et al., although supported PD was not associated with an increased risk of peritoneal infection when nurses from the PD center made regular home visits (15). These findings suggested that aided PD had no relationship with peritonitis rates.

In terms of technical issues, catheter malfunction, and transfer to hemodialysis (HD), both groups were comparable. In contrast to our findings, a study of 9822 incident PD patients detected between January 2002 and December 2010 by the RDPLF indicated that assisted patients were less likely to be shifted to HD than self-care patients (16). Querido et al. also discovered that technique survival was greater in PD patients who were assisted than in were self-care PD (17). We believe that by helping some elderly patients who are too weakened to self-dialyze, or patients who need assistance for any medical reason, the risk of PD technical failure can be reduced to a rate comparable to patients who dialyze on their own. Relatively small number and short follow-up

Table 2. Demographics of helpers and their normal controls and characteristics of the SF36 quality of life scale

Items	Control Group, (n=43)	Assistants Group, (n=40)	p
Age(years)	43.3±15.1	46.7±14.7	0.303[1]
Gender, F/M (% female)	23/20 (53.5%)	21/15 (58.3%)	0.666[2]
Education **1. Literate** **2. Primary education** **3. High school**	 3 (7%) 14 (32.6%) 13 (30.2%)	 7 (17.5%) 17 (42.5%) 8 (20%)	0.244[2]
SF36 Quality of Life Scale Features			
Physical function	90 (50-100)	57.5 (0-100)	<0.001[3]
Physical role difficulties	100 (75-100)	0 (0-100)	<0.001[3]
Emotional role difficulties	100 (0-100)	16.7 (0-100)	<0.001[3]
Energy/vitality	56.8±21.7	47±24.2	0.054[1]
Mental health	64.6±18.8	64.6±22.5	0.087[1]
Social functionality	100 (25-100)	50 (0-100)	<0.001[3]
Pain	90 (0-100)	55 (0-100)	0.001[3]
General health perception	77.4±17.5	47±24	<0.001[1]
TotalSF36 score	3020 (2075-3460)	1575 (375-3505)	<0.001[3]

time may cause this discrepancy.

Owing to the high levels of physical disability among aPD patients, caregivers are required to provide assistance with personal care in addition to renal-specific treatment (18). Despite their greater involvement in such practical chores, caregivers of aided PD patients their energy and psychological health scale was comparable to that of the control group. This was similar to prior research, which indicated that caring for PD patients had no negative impact on caregivers' psychology (19). It has also been proposed that this is due to Asian cultural standards and expectations of a cohesive family unit and filial piety (20). The moral responsibility of spouses or children, who made up the vast majority of caregivers in our study, to care for and shelter elderly parents may explain the status of psychological scale. In order to comprehensively investigate the dynamics of reactions across time, it is imperative to conduct replications in diverse situations and employ longitudinal designs.

The scales of the SF-36 test related to physical function, physical role difficulty, emotional role difficulty, social functionality, and pain were significantly lower in the assistants. In the caregiver group, perceptions of general health were lower. This finding is consistent with previous research findings. (21,22) Caregivers of aided PD patients have lower QoL and greater burden than the general population. Because of their heavy workload and elevated burden, caregivers' health suffers, making them more susceptible to depression, anxiety, and other medical issues. Consequently, public and private health expenditure has increased (23). It also affects the care provided to patients, and consequently, the efficacy of their treatment (23). Therapies that enhance well-being are required to alleviate these severe conditions (24-26).

Therapies with multiple components that address both disease-related difficulties and personal requirements of caregivers are more likely to yield substantial benefits. In addition, because it will prevent chronic kidney disease complications in patients and health problems in caregivers, it is anticipated that it will not only impact the caregiver-patient relationship but also reduce public and private health expenditures (23).

Information and communication technology-based (ICT)-based interventions are promising. Information and communication technologies are instruments that can be used to unite individuals for common purposes. According to a 2014 systematic review, telehealth enhances the well-being of family caregivers of patients with dementia, cancer, stroke, heart disease, spinal cord injury, brain injury, mental illness, and chronic diseases in general. The technological resources used were video conferencing, text messaging, phone calls, and web-based data. The findings revealed improvements in mental and physical health, quality of life, caregiver knowledge and skills, social support, and coping abilities (27). ICT has been identified as a viable option for future research because the QoL of caregivers of patients with PD is comparable to that of caregivers of patients with other chronic conditions (27,28). Another option is to provide a professional support to PD patients. Several nations have developed aPD strategies over the past few decades. The model varies based on the type of assistant employed and level of assistance offered. With positive clinical outcomes, both health care and non-health care assistants have been utilized (29). To address the difficulties faced by caregivers, mechanisms involving specialists should be developed.

The study's limitations arise from its relatively small sample size and cross-sectional design.

CONCLUSION

The results of this study imply that caregiver burden and quality of life concerns should not preclude the use of aPD, thereby extending the efficacy of assisted PD for survival and peritonitis outcomes established in earlier studies (15,30). Assisted PD may make PD a viable treatment option for more patients, including those who cannot care for themselves or lack confidence in self-administration, without negatively influencing the patient or caregiver (31). This is especially essential in light of the increasing number of ESRD patients and the need to relocate dialysis care away from overcrowded HD facilities to reduce healthcare expenditures (32). To address the difficulties faced by caregivers, mechanisms involving specialists may be developed. The use of information and communication technology (ICT) is the second potential strategy to overcome the difficulties of caregivers.

DECLARATIONS

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Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the Sakarya University Ethics Committee(approval number 186, 31.05. 2023)

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study, and they were allowed to withdraw at any time.

Data Availability Statement: All data reported in the article are available in anonymized form upon request.

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