

Research Article

Quality of life and willingness to pay for receiving hemodialysis in patients who received peritoneal dialysis in Thailand

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ABSTRACT

This cross-sectional study was conducted to evaluate quality of life (QoL), willingness to pay (WTP) for receiving hemodialysis (HD), and factors influencing QoL in patients who received peritoneal dialysis (PD) in Thailand. Data of PD patients visiting secondary or tertiary hospitals from December 2020 through June 2021 were collected. EuroQoL EQ-5D-5L questionnaire was used to evaluate QoL. After the patients completed the questionnaire, they were interviewed using the contingent valuation method to derive their WTP for switching to HD. Patients randomly picked up one payment card as an initial price for receiving HD, then bidding by 100 Thai Baht (THB) up and down to reach the maximum affordable WTP amount. Multiple linear regression was used to identify factors affecting QoL. A total of 102 patients were included in this study. The mean age was 58 years. EQ-5D utility score was 0.71 ± 0.32 . Five variables were the factors that affect QoL included serum albumin, hospitalization, age, urine output, and hemoglobin level. Average WTP was 233 ± 293 THB (7.2 ± 9.0 USD) per HD session. Quality of life among these study patients was slightly higher than reported in Thai patients with low hemoglobin level. Treatment anemia to reach hemoglobin target and preservation of residual urine output might improve QoL. The average WTP for switching to HD among PD patients was only one-sixth of general billing price for HD.

Keywords:

Quality of life, Willingness to pay, Hemodialysis, Peritoneal dialysis

1. INTRODUCTION

Chronic kidney disease (CKD) is one of the most common chronic diseases that raises medical concerns worldwide. The prevalence of CKD among the global population in 2017 was 9.1%¹. The incidence of patients with end-stage renal disease (ESRD) who require long-term renal replacement therapy (RRT) ranges from 22 to 493 per million population per year². Although the benefits of long-term hemodialysis (HD) and peritoneal dialysis (PD) in terms of survival for such patients are comparable³, more patients undergo HD in most countries. The usage of PD within Asian countries varies widely from 0% to 28% of all RRT⁴.

In Thailand, all 3 modalities of RRT including HD, PD, and kidney transplantation (KT), are available for ESRD patients. Although KT is the modality of choice and the KT rate has increased over time, the rate is limited due to low organ donations⁵. Therefore, most ESRD patients in Thailand are on dialysis whether HD (76%) or PD (20%)⁶. Many burdens of HD were reported two decades ago; therefore, the first PD policy was developed and has been implemented since January 2008⁷.

There are 3 types of health insurance schemes for public health coverage: the Social Security Scheme (SSS), the Civil Servant Medical Beneficiary Scheme (CSMBS), and the Universal Health Coverage Scheme (UHCS).

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UHCS accounted for the vast majority (around 75%) of coverage of the Thai population⁸. Regarding the PD first policy, continuous ambulatory peritoneal dialysis (CAPD) is preferred for patients under the UHCS reimbursement program, not requiring additional payment⁷, whereas HD is considered when the individual patient has a contraindication for undergoing PD. Patients under UHCS who decline CAPD and decide to undergo HD with no indication mentioned above have to self-fund for HD costs⁹. With the updated reimbursement policy of the National Health Security Office (NHSO) in February 2022, patients under UHCS can choose either PD or HD for long-term RRT¹⁰.

There were few studies reported QoL of PD patients in Thailand. Findings from previous studies were not comparable. Therefore, this study was conducted to evaluate QoL and factors influencing QoL of PD patients in Thailand. Moreover, we also would like to measure willingness to pay (WTP) for switching to receive HD.

2. MATERIALS AND METHODS

2.1. Patients

This cross-sectional study was conducted between December 2020 and June 2021 at a secondary hospital and a tertiary hospital in Chiang Mai, located in the northern part of Thailand. About 120 patients receiving CAPD regularly visited the outpatient PD clinic at each hospital. All ESRD patients who met the following criteria were included in the study: aged ≥ 18 years, receiving CAPD for at least 3 months, and agreed to participate. The eligible patients were excluded if unable to communicate in the Thai language. Informed consent was collected from individual patients. Since the patients had monthly visits to the PD clinic at the tertiary hospital, all eligible patients who visited in the second, third, and fourth week of the month would be included in the study. For patients at the secondary hospital, where patients regularly visited every 2-3 months, purposive sampling was used in that setting.

2.2. Data collection and outcome measures

Demographic characteristics, PD prescription, laboratory data, and medication use were collected from electronic medical records. Individual patient interviews using a structured questionnaire were done in a separate area at the PD clinic while patients were waiting to see a nephrologist. Patients were asked about their socio-economic status including working status, occupation, education, marital status, income per month, and out-of-pocket expenditure for each visit. Then, the patients were asked to complete the Thai version of the 5-level European Quality of Life-5 Domain Questionnaire (EQ-5D-5L) for measuring QoL¹¹.

Each patient's WTP for receiving HD was assessed using the contingent valuation method (CVM). In this scenario, the researcher provided information on each RRT modality to the study patients, and they were assumed choosing to undergo HD. Then, the patients randomly picked up one payment card to use as an initial price for receiving HD in a bidding game. Starting from that initial price, the study patient was asked to increase the price by 100 THB until refusing to pay. The price before the last price would be the WTP amount for each session of HD. However, the price was decreased by 100 THB if the person denied paying at the initial price until the patient accepted to pay. In this case, the last would be the WTP price. The currency in THB was converted to USD using the exchange rate from the Bank of Thailand on June 30, 2021 where 32.50 THB = 1 USD.

2.3. Statistical analysis

Data was executed using STATA version 14.0 (Stata Corp, USA). The Shapiro-Wilk test was used to test data distribution normality. Categorical variables were presented in percentages. Continuous variables were expressed as mean \pm standard deviation (SD) for data with normal distribution or median (interquartile range, IQR) if skewed. Parametric or non-parametric statistics were used to compare the variables between the groups as appropriate. Multivariate analysis was used to identify factors affecting QoL. Pre-specified factors affecting QoL were included in the analysis based on previous published studies in Asia¹²⁻¹³. Those factors were age, hemoglobin, albumin, education level, working status, and dialysis vintage. In addition, we added more suspected variables that would affect QoL such as gender, net ultrafiltration fluid, residual urine output, hospitalization within the previous year, number of medications use, hospital level, and willingness to pay for switching to HD. Then, we performed multivariate analysis and removed insignificant variables from the model. Statistical significance was considered if $p < 0.05$.

3. RESULTS

3.1. Demographic characteristics

Among 102 patients included in the study, each 51 patients received treatment at either a secondary hospital or a tertiary hospital. Half of the study patients were female. The average age was 58.30 ± 11.82 years. Half of them had undergone CAPD for more than 2 years. Average hemoglobin level was 10.23 ± 1.61 g/dL. One-third of patients had residual urine output of more than 400 mL/day. Most patients (65%) had finished primary school. About 75% were unemployed or retired from their jobs. Demographic characteristics are shown in Table 1.

Table 1. Demographic characteristics of patients receiving peritoneal dialysis.

Characteristics	Results
Female, n (%)	52 (50.98)
Age (year), mean±SD	58.3 ± 11.8
Body weight, mean±SD	57.2 ± 10.7
PD vintage (year), mean±SD	3.4 ± 2.9
Hypertension, n (%)	84 (82.35)
Diabetes mellitus, n (%)	42 (41.18)
Education, n (%)	
None	9 (8.82)
Elementary school	67 (65.69)
Secondary school	19 (18.63)
College or above	7 (6.86)
Working status, n (%)	
Employed	25 (24.51)
Unemployed	49 (48.04)
Retired	28 (27.45)
Occupation, n (%)	
Agriculture	53 (51.96)
Private business	21 (20.59)
Labor	15 (14.71)
Hospital setting	
Secondary hospital	51 (50.00)
Tertiary hospital	51 (50.00)
Reimbursement, n (%)	
UHCS	98 (96.08)
SSS	4 (3.92)
Income (THB (USD) per month), mean±SD	2,692 ± 5,224 (83 ± 161)
Patient out-of-pocket (THB (USD) per OPD visit, mean±SD)	326 ± 463 (10 ± 14)
Marital status, n (%)	
Married	86 (84.31)
Single/divorced	16 (15.69)
Urine output (mL/day), n (%)	
Median (IQR)	200 (0-550)
< 400	67 (65.69)
≥ 400	35 (34.31)
Net ultrafiltration fluid (mL/day), median (IQR)	600 (400-900)
Peritonitis within 1 year, n (%)	21 (20.59)
Hospitalization within 1 year, n (%)	33 (32.35)
Cause of hospitalization, n (%)	
PD-related Peritonitis	21 (63.64)
Volume overload	5 (15.15)
Systemic infections	4 (12.12)
Others	3 (9.09)
Serum potassium (mEq/L), mean±SD	3.8 ± 0.7
Serum albumin (g/dL), mean±SD	3.4 ± 0.1
Hemoglobin (g/dL), mean±SD	10.2 ± 1.6
Number of medications use per day, n (%)	
< 10 items	33 (32.35)
≥ 10 items	69 (67.65)
ACEIs or ARBs use, n (%)	60 (58.82)
Phosphate binder use, n (%)	67 (65.69)
KCl supplement use, n (%)	52 (50.98)
Laxatives use, n (%)	58 (56.86)
Epoetin alfa use, n (%)	86 (84.31)
Epoetin alfa dose (unit/week), n (%)	
< 4,000	28 (27.45)
4,000 - 8,000	67 (65.69)
≥ 8,000	7 (6.86)

ACEIs, angiotensin converting enzyme inhibitors; ARBs, angiotensin receptor blockers; IQR, interquartile range; KCl, potassium chloride; OPD, outpatient department; PD, peritoneal dialysis; SD, standard deviation; SSS, Social Security Scheme; THB, Thai Baht; UHCS, Universal Coverage Scheme; USD, United States Dollar

3.2. Quality of life

The average EQ-5D-5L utility score was 0.71 ± 0.32 and EQ visual analogue scale (VAS) was 64.70 ± 18.21 . Patients had the greatest score in self-care while many patients suffered the most in mobility compared with other categories. The average QoL score between patients who received treatment at the secondary hospital and those at the tertiary hospital were comparable ($p > 0.05$). QoL among patients receiving PD is shown in Table 2.

3.3. Willingness to pay

The average WTP for receiving HD was 233 ± 292 THB (7.2 ± 9.0 USD) per session. About 22% were not

willing to pay for HD. WTP for receiving HD is shown in Table 3.

3.4. Factors affecting quality of life

From multiple linear regression analysis using stepwise approach where 13 variables were plugged into the model, 5 variables including serum albumin, hospitalization within the previous year, age, residual urine output, and hemoglobin level demonstrated significant predictors of QoL (Adjusted r^2 0.325, $p < 0.001$). The model for predicted QoL is shown in Table 4 with the following: QoL = 0.223 Serum albumin + 0.001 Urine output + 0.032 Hemoglobin - 0.110 Hospitalization - 0.007 Age + 0.031.

Table 2. Quality of life among patients receiving peritoneal dialysis.

Quality of Life	n (%)				
	Level 1	Level 2	Level 3	Level 4	Level 5
EuroQoL (EQ-5D-5L)					
Dimension 1: Mobility	61 (59.80)	16 (15.69)	8 (7.84)	11 (10.78)	6 (5.88)
Dimension 2: Self-care	85 (83.33)	9 (8.82)	2 (1.96)	3 (2.94)	3 (2.94)
Dimension 3: Usual activities	74 (72.55)	12 (11.76)	6 (5.88)	5 (4.90)	5 (4.90)
Dimension 4: Pain/discomfort	49 (48.04)	30 (29.41)	17 (16.67)	2 (1.96)	4 (3.92)
Dimension 5: Anxiety/depression	78 (76.47)	15 (14.71)	8 (7.84)	0 (0)	1 (0.98)
Utility score, mean \pm SD	0.71 \pm 0.32				
Utility score, median (IQR)	0.78 (0.57-1)				
Visual analogue scale (VAS)					
Mean \pm SD	64.70 \pm 18.21				
Median (IQR)	70 (50-80)				

EQ-5D-5L, the European Quality of Life Group's 5-dimension 5-level questionnaire; IQR, interquartile range; SD, standard deviation

Table 3. Willingness to pay for receiving hemodialysis.

Willingness to pay (THB / USD)	Secondary hospital	Tertiary hospital	Overall
All patients (n = 102)			
Mean \pm SD	208 \pm 156 (6.4 \pm 4.8)	259 \pm 384 (8.0 \pm 11.8)	233 \pm 293 (7.2 \pm 9.0)
Min	0 (0)	0 (0)	0 (0)
Max	700 (21.5)	1,500 (46.2)	1,500 (46.2)
Excluded patients who rejected to pay out-of-pocket (n = 80)			
Mean \pm SD	216 \pm 153 (6.7 \pm 4.7)	425 \pm 414 (13.1 \pm 12.8)	298 \pm 300 (9.2 \pm 9.2)
Min	50 (1.5)	100 (3.1)	50 (1.5)
Max	700 (21.5)	1,500 (46.2)	1,500 (46.2)

IQR: interquartile range, SD: standard deviation, THB: Thai Baht, USD: United States Dollar

Table 4. Model of quality of life for PD patients switching to HD.

Variable ¹	Coefficient	Standard error	t	P	95% confident interval
Albumin	0.2227	0.0474	4.70	<0.001	0.128 - 0.317
Age	-0.0072	0.0023	-3.15	0.002	(-0.012) - (-0.003)
Urine output	0.0001	0.0001	2.27	0.026	0.0001 - 0.0002
Hospitalization	-0.1102	0.0573	-1.92	0.058	(-0.2240) - 0.0037
Hemoglobin	0.0323	0.0172	1.88	0.063	(-0.0018) - 0.0666
Constant	0.0310	0.2705	0.11	0.909	(-0.5060) - 0.5680

HD, hemodialysis; PD, peritoneal dialysis

¹ 13 variables were included for analysis but 8 variables including sex, education, working status, net ultrafiltration fluid, number of medications use per day, and willingness to pay for switching to HD were not statistically significant.

4. DISCUSSION

The current study revealed that PD patients reported their health-related QoL at 71% of the perfect health state. The higher in QoL comparing to those reported during the past two decades might reflect an improvement of CKD treatment these days. Survey studies in Switzerland in 2004¹⁴ and UK in 2005¹⁵ showed that PD patient reported utility score of 0.57 and 0.61, respectively. Among Asian countries, utility score of 0.71 of Thai patients in this study fell in between those reported from the studies in Singapore¹² (0.60) and Taiwan¹⁶ (0.90). Population in Taiwan study¹⁶ had more employment rate, higher educational level, and were younger than those in this study and Singapore study¹². However, average dialysis vintage was comparable among these 3 Asian studies which was about 3.5 years.

Average utility score in this study (0.71) was slightly higher than that reported in a study among Thai PD patients by Sakthong et al¹³ (0.65). On the other hand, it was lower than that reported in a study by Thaweethamcharoen et al.¹⁷ (0.80). The difference in utility score might be the result from different patient characteristics in those 3 studies in Thailand. Among 3 studies, patients enrolled in a study by Thaweethamcharoen et al¹⁷ had the highest average hemoglobin levels (10.6 g/dL) compared with 10.2 g/dL in this study and 8.7 g/dL in a study by Sakthong et al¹³. Another important patient characteristic was duration of PD vintage. This study reported PD vintage of 3.4 years which was the lowest duration compared with 3.6 and 7.4 for Thaweethamcharoen et al¹⁷, and Sakthong et al¹³, respectively. Population in this study had less employment rate than those in a study by Thaweethamcharoen et al¹⁷.

We further analyzed factors that showed impact on QoL. We found that patients' urine output was one out of 5 key factors affecting QoL in this study. As would be expected, patients with high urine output had greater utility score than those with low urine output or no residual urine. The result in this study was concordant with findings from a prospective cohort study by Shafi et al¹⁸. They found that HD patients with urine output had better QoL. Moreover, hemoglobin level was another key factor. About 62% of these patients reached the target hemoglobin level¹⁹. Patients who had hemoglobin level above 10 g/dL had better utility score. In addition, serum albumin was a key factor affecting QoL. Patients who had serum albumin above 3.5 g/dL had greater utility score compared with those who had serum albumin below 3.5 g/dL (0.80 vs 0.60, respectively).

Hospitalization within a previous year was also a key factor affecting QoL. Patients who admitted to the hospital within the previous year had lower utility score than those with no hospitalization. PD-related peritonitis was the most frequent reason for hospital admission, accounted for 62% of all causes. Moreover, patients

with peritonitis also experienced more hospitalization and lower QoL than those without peritonitis (60.6 % vs 39.4%, $p < 0.001$, and 0.53 ± 0.43 Vs 0.76 ± 0.28 , $p = 0.003$, respectively).

The fifth key factor was age. Nearly 60% of the study population was more than 60 years old. Patients with older age had lower utility score than younger patients. Patients aged ≥ 60 years tended to have peritonitis more than younger patients, but this was not statistically significant (24.6% vs 14.6%, $p > 0.05$). However, elderly populations were vulnerable to complications, especially PD-related peritonitis²⁰.

The NHSO under Ministry of Public Health¹⁰ has recently announced that all patients under UHCS who required long-term RRT are allowed to choose either HD or PD free of charge starting from February 1, 2022. HD and its relevant fees are all subsidized according to the updated reimbursement policy. From this policy, it would result in substantially economic burden to the payer in the long run since treatment cost incurred from HD is greater than PD in most countries²¹. Based on the findings of this study which included population having average income of only 14% of GNI per capita of Thailand in 2020 (7,050 USD)²², 80% of the population were willing to pay for switching to HD of 233 THB (7.2 USD). Therefore, to sustain this above updated policy, allowing patients to co-pay with their affordable amounts might be in need.

We conducted a mock scenario assuming that patients were initially entered in ESRD and needed treatment with long-term RRT. Which modality did patients prefer to receive? Interestingly, two-third of patients preferred CAPD to either HD or KT (Table S1). The possible explanation in this regard was the convenience of receiving treatment. CAPD can be self-performed at home (37%), has low out-of-pocket expenditure (34%), and has acceptable clinical outcomes (20%).

Some limitations in our study were taken into consideration. First, with a cross-sectional study design, a causal relationship between QoL and other factors was not able to be identified. Second, the generalizability of our findings might be limited due to almost all patients in this study were under UHCS. Besides, most patients had very low income. Further research should be conducted to enroll PD patients with different levels of income in all reimbursement program, and in various geographical areas of Thailand.

5. CONCLUSION

Quality of life among these study patients was slightly higher than reported in patients with low haemoglobin level. Hospitalization, age, urine output, and haemoglobin level were associated with QoL. Treatment renal anemia to reach hemoglobin target and preservation of residual urine output might improve QoL.

Table S1. Preferred modality for long-term renal replacement therapy.

Modality	Secondary hospital	Tertiary hospital	Overall
Peritoneal dialysis	33 (64.71)	31 (60.78)	64 (64.75)
Hemodialysis	7 (13.73)	2 (3.92)	9 (8.82)
Kidney transplantation	11 (21.57)	18 (35.29)	29 (28.43)
Total	51 (100)	51 (100)	102 (100)

n (%)

The average WTP for switching to HD among PD patients was only one-sixth of general billing price for HD in Thailand.

6. ACKNOWLEDGEMENT

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Author contribution

All authors were responsible for developing study design and protocol, provided comments, and have read and approved the final version. WS performed literature search, developed the methodology, collected data, analyzed data, and prepared the manuscript. UP developed the methodology, verified data, and prepared the manuscript. SV, YS, and SD supervised the protocol development and data collection at study sites and prepared the manuscript.

Conflicting of interest

None to declare

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Ethical approval

The study was approved by IRB Committee, Faculty of Medicine, Chiang Mai University (COA No. 401/2563), and IRB Committee, Sanpatong Hospital (COA No. 009/2563).

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Informed consent

Informed consent was obtained from the individual patients who agreed to participate in the study before starting the interview.

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