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Peritoneal Dialysis; Egyptian Experience

Hassan A. Ahmed, Ahmed R. Elarbagy, Ahmed M. Zahran, Ahmed R. Tawfek, Khalid M. Elzorkany and Mohamed K. Shaaban

Department of internal medicine, Menofia Faculty of medicine, Egypt.
mohammedshaaban@hotmail.com

Abstract: Objectives: to study the clinical and laboratory characteristics and the associated comorbidities (complications) of Egyptian patients on CAPD in two centers. **Background**: Peritoneal dialysis is the method of renal replacement therapy used by about 200,000 patients worldwide. Since the introduction of continuous ambulatory peritoneal dialysis (CAPD) and of compact "easy-to-use" hydraulic cyclers for automated peritoneal dialysis (APD), the popularity of peritoneal dialysis has increased greatly. This is because peritoneal dialysis is simple, convenient, and relatively low cost, and because it can be done in the home. **Methods:** This cross-sectional study was carried out during the period from January to July 2017 on 21 patients with ESRD maintained on PD. Patients were collected from Nephrology and Dialysis department of Damanhour Medical National institute (16 patients) and Nephrology and Dialysis department of Mansoura General Hospital (5 patients). All patients were shifted from HD to PD due to poor vascular access. Participants were given informed consents and the study was approved by the Ethical and Medical Research Committee of the Menoufia University and the included institutes. All patients were subjected to thorough medical history taking, physical examination, and many investigations as well as assessment of dialysis adequacy by calculation of weekly KT/V and assessment of dialysis related complications. Also, assessment of health related quality of life of ESRD patients by WHOQOL-BREF questionnaire was done. **Results:** All studied patients were shifted from HD to PD due to failure of having vascular access. Patients with hepatitis C were 28.6% and none had hepatitis B infection. Main cause of ESRD was hypertension followed by diabetes. The most obvious problems in the studied patients was related to catheter problems in the form of infection and obstruction besides nutritional problems as indicated by hypoalbuminemia. It is recognized that patients with ESRD have to cope with many adversities eg. Physical symptoms, dietary regimes regardless of the treatment modality. According to scores of each domain of WHOQOL-BREF questionnaire only 6 patients had bad QOL in physical domain 1 and this was seen in patients with lower albumin level. In domain 2 (psychological), 76.2% have good QOL and this could be due to flexibility and less social restriction offered by PD modality. The social domain (domain 3) offers similar results as domain 2 with 81% have good QOL while the environmental domain 4 showed the lowest percentage of good QOL most probably due to financial and employment problems. **Conclusion:** all patients were not offered PD as a modality of RRT until they had vascular access failure. Hypertension was the most common cause of ESRD in these patients while low albumin and catheter related problems were the most common problem and complications. Lack of education, financial problems and unemployment were important factors that affect QOL on our patients. Although our patients QOL is lower than normal population but is higher if compared with those of HD.

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Key words: Peritoneal dialysis in Egypt- Quality of life in CAPD

1. Introduction

Peritoneal dialysis involves diffusive and convective transports and osmosis through the highly vascularized peritoneal membrane. The capillary endothelium offers the rate-limiting hindrance for solute and water transport:

- The blood in the peritoneal capillaries, which in renal failure contains an excess of urea, creatinine, potassium, and other waste products.

-The dialysis solution in the peritoneal cavity, which typically contains sodium, chloride, and lactate or bicarbonate and which is rendered hyperosmolar by the inclusion of a high concentration of glucose.

During the course of a peritoneal dialysis dwell, three transport processes occur simultaneously: diffusion, ultrafiltration, and absorption. The amount of dialysis achieved and the extent of fluid removal depend on the volume of dialysis solution infused (called the dwell volume), how often this dialysis

solution is exchanged, and the concentration of crystalloid osmotic or colloid oncotic agent present **[1].**

Complications PD include:

- Complications of PD catheters
- Volume overload
- Hypertension and hypotension in PD
- Nutritional complications in PD
- Other complications

In Egypt, HD was first introduced as a modality of treatment of ESRD in the Department of Internal medicine, Faculty of Medicine, Cairo University in 1972. Since then, HD programs and facilities have also been developed and are available in other teaching hospitals and centers **[2].**

The vast majority of these patients are on HD and are treated using about 3000 machines in over 600 dialysis units of which 25% are government run and 75% are private. Very few patients are treated with PD. CAPD is not offered in majority of centers because the costs are still not fully covered by health insurance and the Ministry of health **[2].** Till 2010, each HD session use to cost 20 US $ compared to 10 US $ for each CAPD exchange **[3].**

2. Subjects & Methods:

This cross-sectional study was carried out during the period from January to July 2017 on 21 patients with ESRD maintained on PD. Patients were collected from Nephrology and Dialysis department of Damanhour Medical National institute (16 patients) and Nephrology and Dialysis department of Mansoura General Hospital (5 patients).

All patients were shifted from HD to PD due to poor vascular access. Participants were given informed consents and the study was approved by the Ethical and Medical Research Committee of the Menoufia University and the included institutes.

Inclusion criteria:

All available PD patients of both sexes in Nephrology and Dialysis department of Damanhour Medical National institute (16 patients) and Nephrology and Dialysis department of Mansoura General Hospital (5 patients) were included.

All patients were adults (>18 years).

All patients of PD were following CAPD modality in average of 4 dwells per day and extended along the 24 hours (6 hours per dwell) using regular concentrate dialysate fluid unless occasional events when ultrafiltration was needed to be increased.

All patients used ESAs according to KDIGO guidelines and aimed to HB level in target of 10.5 – 13 gm/dl **[4].**

All patients used iron supplementations according to KDIGO guidelines aiming to maintain serum ferritin target of more than 200 ng/ml and T.SAT % targets of 20- 50% **[4].**

All patients used calcium supplementations, phosphate binders, calcimimetics according to latest KDIGO guidelines aiming to maintain serum Ca in target level (8.5-10.5 mg\dl), serum phosphorus in target level (2.5-4.5 mg\dl) and iPTH target 2-9 upper normal level (10-65 pg/mL) **[5].**

All patients underwent:

- Full medical history.
- General examination.
- Laboratory investigations:
  - Blood urea and serum creatinine
  - Complete blood count
  - Serum ferritin, transferrin saturation
  - Serum calcium
  - Serum phosphate
  - Na and K
  - Intact PTH
  - Serum Albumin
  - Lipid profile
  - Viral markers (HCV, HBV, HIV)
- Assessment of dialysis adequacy by calculation of weekly KT/V

-Assessment of dialysis related complications such as:

- Infection
- Obstruction of access
- Electrolyte problems (Po4, Ca, Na and K)

-Assessment of health related quality of life of ESRD patients by WHOQOL-BREF questionnaire.

Methods:

-Blood sampling: venous blood samples were obtained and the studied biochemical parameters were performed via the standard laboratory procedures using an automated analysis.

-Calculation of KT/v:

For calculation of KT/V in PD groupwe estimated weekly KT/V calculation using the following equation:

Weekly Kt/V=[D/P urea x Dialysate Volume] x T

Vd urea

- D/P urea=dialysate urea/ plasma urea in mg/dl
- T = dialysis time (7 days in weekly KT/V)
- Dialysate Volume = 24 h dialysate Volume in Liters
- Vdurea = Volume of distribution of urea (TBW) in Liters

Target KT/V was considered according the latest **Peritoneal Dialysis Adequacy Work Group 2006** guidelines at level of 1.7**[6].**

WHOQOL-BREF questionnaire

The WHOQOL BREF, a generic health-related questionnaire developed by the WHOQOL group was selected to quantify the health-related quality of life of ESRD patients. The WHOQOL-BREF consists of 24 facets and provides a profile of scores on four dimensions of quality of life: physical health (domain 1), psychological (domain 2), social relationships (Domain 3), and the environment (Domain 4) **[7].**

Scoring the WHOQOL BREF

The WHOQOL BREF questionnaire was explained to the patients and then scored after its administration to the study subjects; the raw scores were converted to transformed scores. The first transformation converts scores to a range of 4–20 and the second transformation converts domain scores to a 0–100 scale. Higher scores reflect a better quality of life **[7].** The cutoff point is 60 % of score as concluded in manuscripts **[8].**

Statistical Analysis of the data:

Data were fed to a computer and analyzed using IBM personal computer and SPSS software package version 20.0. and EpiCalc software package version 1.02.

Qualitative data were described using number and percent. The Kolmogorov Smirnov test was used to verify the normality of distribution.

Quantitative data were described using mean and standard deviation.

Statistical tests used for analysis include:

Chi-square test (X2): for categorical variables, to compare two studied groups.

Student t-test (t): for normally quantitative variables, to compare between to studied groups.

Statistical significance of the obtained results was judged at the 5% level (P< or equal 0.05).

3. Results:

This descriptive study was carried out during January2017 till July 2017 on 21 adult patients with ESRD on PD. The PD patients were collected from Nephrology and Dialysis department of Damanhur Medical National Institute (16 patients) and Nephrology and Dialysis department of New Mansura General Hospital (5 patients). All patients were shifted from HD to PD due to poor vascular access. Participants were given informed consent and the study was approved by ethics committee of Menoufia University and the included institutes.

Demographic and clinical characteristics of the studied patients (n= 21):

The characteristics of all 21 PD patients are shown in **[Table 1 and fig. 1]**. The mean age was 49.52 ± 11.63 years. Males constituted 23.8 % (5 patients) while females constituted 76.2% (16 patients). Fifteen patients were HCV negative representing 71.4% and the remaining 6 were HCV positive representing 28.6%. All patients were HBV negative. Regarding hypertension, 9 patients have hypertension representing 42.8% whereas the remaining 12 (57.2%) patients were normotensive. Similarly 9 patients have IHD and 12 have not representing 42.8% and 57.2% respectively. Mean dialysis durations of HD and PD were 7 ± 5.72 years. Mean of HD duration and proceeding PD was 5.2±0.66 and 1.76±1.3 respectively.

The main cause of ESRD was hypertension in 9 patients (42%) while unknown etiology was the second category representing (28.57%). Diabetic nephropathy was the third cause of ESRD (14.28%). **[Table 2and fig. 2]**.

Laboratory investigations of the studied patients (n=21)

The CBC results revealed a mean Hb of 10.39±2.12 gm/dl. Mean of white cell count and platelets was 7.15 ± 1.79 $x10^9$/L and 255 ± 58.9 $x10^9$/L respectively. Results revealed serum Ca of 8.33 ±1.22mg/dl and phosphorus of 5.77± 1.35 mg/dl. Serum albumin mean was 2.93 ± 0.7 gm/dl. Parathyroid hormone mean level was 542 ± 235.8pg/ml. Total cholesterol had a mean of 206.14± 25.57 mg/dl while that of triglycerides was 197± 35.85 mg/dl.

The mean of serum creatinine and BUN was 11.4±5.28 mg/dl and 61.1±21.71 mg/dl respectively. Sodium levels ranged between 130 and 143 mmol/l with a mean of 137.2±4.28 mmol/l while K levels ranged between 2.52 and 6.7 mmol/l with a mean of 4.76±1.03 mmol/l.

Results also revealed that all PD patients managed to achieve their target KT/V (1.95 ± 0.17). (Table 3).

Eight patients had HB level below the target HB level, one patient was above 13 gm/dl and 12 were within the target HB level (10-13 mg %). **[Table 4 and Fig. 3]**.

Regarding T SAT as shown in table 5, five patients had T SAT of less than 20% representing 23.8% while 16 patients had T SAT of more than 20% representing 76.2%. **[Table 5 and Fig. 4]**.

Table 6 and figure 5 show ferritin level in studied patients where 5 patients (23.8%) had levels less than 200 ng/ml while the remaining (16 patients representing 76.2%) had ferritin levels more than 200 ng/ml.

Fifteen patients (71.4%) had low serum albumin level of less than 3.5 gm/dl where 28.6% (6 patients) had levels of more than 3.5 gm/dl as seen in table 7 and fig. 6.

Table 8 and fig.7 show that 10 patients had a normal serum calcium level between 8.5 and 10.5 mg/dl (47.6%). Eleven patients had a low level of less

than 8.5 mg/dl (52.4%). None had calcium level more than 10.5 mg/dl.

Sixteen patients had a high phosphorus level of more than 4.55 mg/dl representing 76.2% and only 5 patients had a normal level between 2.5-4.5 mg/dl representing 23.8%. There was no patients with phosphorus level less than 2.5 mg/dl. **[Table 9 and fig.8]**

For Kt/v only 2 patients had low Kt/V <1.7 while most of patients (90.55%) achieved targeted level (1.7 according to **Peritoneal Dialysis Adequacy Work Group 2006**). **[Table 10 and fig. 9]**.

Dialysis complications

At time of study only one patient had peritonitis representing 4.76%, 2 had catheter obstruction representing 9.52 and 17 had no complications (80.95%).

The sum of peritonitis episodes were 31 episodes in all patients during the preceding year representing an average of 1.47 episode per patient per year [**Table 11**].

Hyperkalemia was present in 2 patients whereas hypokalemia was present in only one patients. Hypocalcemia was present in 52.4% of the studied group (11 patients while hyperphosphatemia was found in 16 patients (76.2%).

Correlations:

There was significant negative correlation between Hb and PTH and phosphorus, while there was positive significant correlation with Kt/V, T SAT and Ferritin levels with P value of 0.0, 0.027, 0.005, 0.001 and 0.002 respectively. (Table 12)

There was significant negative correlation between PTH and Hb and ferritin while there was positive significant correlation with T SAT and phosphorus.

Table (1): Demographic and clinical characteristics of the studied patients

Variable	Number (percentage)	Min.-max.	Mean ± SD
Age (years)		31-71	49.5±11.63
Males	5 (23.8%)		
females	16 (76.2%)		
Weight (Kg)		57-95	74.19 ±9.46
Height (meters)		1.56-182	1.65 ±0.64
BMI (Kg/m^2)		23.12-33.87	27.2 ± 2.59
HCV -ve **HCV +ve**	15 (71.4%) 6 (28.6%)		
HBV –ve **HBV +ve**	21 (100%) 0 (0%)		
Hypertension +ve **Hypertension -ve**	9 (42.8%) 12(57.2%)		
IHD +ve **IHD -ve**	9 (42.8%) 12(57.8%)		
Total dialysis duration (HD+PD) (years)		3-24	7 ± 5.72
Duration of HD (years)		2-19	5.2 ±.66
Duration of PD (years)		1-5	1.8 ±1.3

Demographic and clinical characteristics of the studied patients (n= 21):

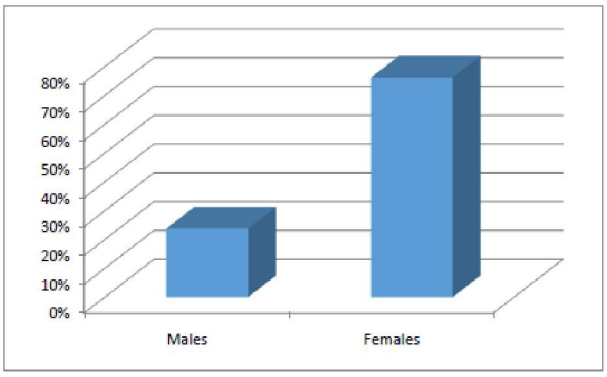

Figure (1): Sex distribution among the studied PD patients (n=21)

Table (2): Etiology of ESRD in studied patients (n=21)

Causes	Number	percentage
Hypertension	9	42%
Diabetes mellitus	3	14.28%
Analgesics nephropathy	1	4.76%
SLE	1	4.76%
Congenital causes	1	4.76%
Unknown	6	28.57%
Total	21	100%

WHOQOL-BREF

According to scores of each domain of WHOQOL-BREF questionnaire 6 patients had bad QOL in the physical health domain (domain 1) while

the rest (15 patients) had good QOL representing 28.6% and 71.4% respectively.

In domains 2 (psychological), 3 (social relation) and 4 (environment) the number of patients who had BQL were 5 (23.8%), 4 (19%) and 7 (33.3%) while those who had good QOL were 16 (76.2%), 17 (81%) and 14 (66.7%) respectively.

The table No. 15 shows that there is no significant association between the studied parameters and good or bad QOL in domain 1.

Table 16 shows that there is no significant relation between the studied parameters and good or bad QOL in domain 2 (psychological).

Table 17 shows that there is no significant relation between the studied parameters and good or bad QOL in domain 3 (social relationship) (Table 17).

Table 18 shows that there is no significant relation between the studied parameters and good or bad QOL in domain 4 (environment) (Table 18).

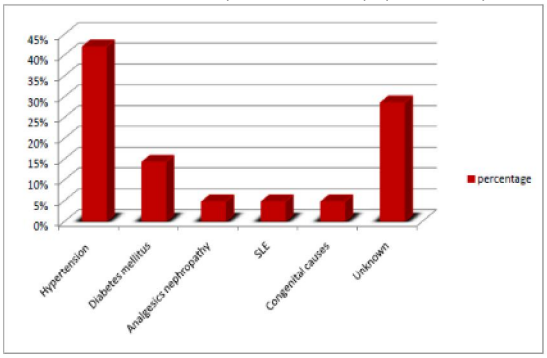

Figure (2): Aetiology of ESRD of the studied PD patients.

Laboratory investigations of the studied patients (n=21)

Table (3): Laboratory data of the studied patients (n=21)

Variable	Range: Min.-Max.	Mean ± SD
Hb (gm/dl)	6.7-14.3	10.39 ± 2.12
WCC (x10^9/l)	3.9-10.9	7.15 ± 1.79
Platelets (x10^9/l)	131-379	255 ± 58.9
T.SAT %	11-37%	24.14 ±7.39
Ferritin (ng/ml)	103-411	277.57 ± 88.31
Ca (mg/dl)	4.5-10	8.33 ±1.22
Po_4 (mg/dl)	4.1-8.4	5.77 ± 1.35
Na (mmol/l)	130-143	137.2±4.28
K (mmol/l)	2.52-6.7	4.76±1.03
Albumin (gm/dl)	1.2-3.9	2.93 ± 0.7
iPTH (pg/ml)	217-914	542 ± 235.8
Cholesterol (mg/dl)	164-266	206.14± 25.57
Triglycerides (mg/dl)	145-277	197± 35.85
Kt/V	1.5-2.2	1.95 ± 0.17
Creatinine (mg/dl)	3.1-29	11.48 ±5.28
BUN (mg/dl)	26-93	61.6±21.71

Table (4): Distribution of studied PD patients according to Hb gm/dl level

Hb (gm/dl)			
	<10	10-13	>13
Number (total 21)	8	12	1
percent	38%	57.2%	4.8%

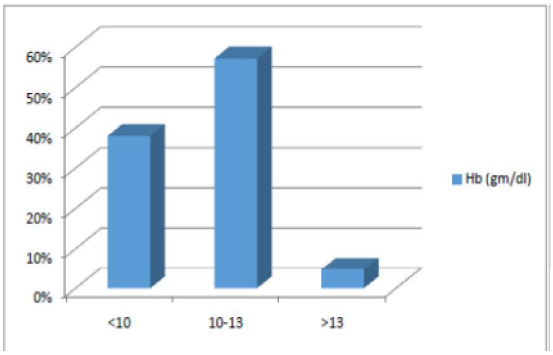

Figure (3): Distribution of patients according to PD level.

Table (5): Distribution of studied PD patients according to T SAT

T SAT		
	<20%	>20%
Number (total 21)	5	16
percent	23.8%	76.2%

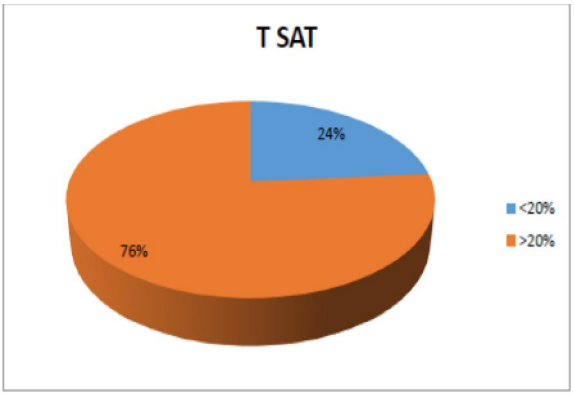

Figure (4): Distribution of the studied PD patients according to TSAT.

Table (6): Distribution of studied PD patients according to serum Ferritin level

Serum Ferritin (ng/ml)		
	<200	>200
Number (total 21)	5	16
percent	23.8%	76.2%

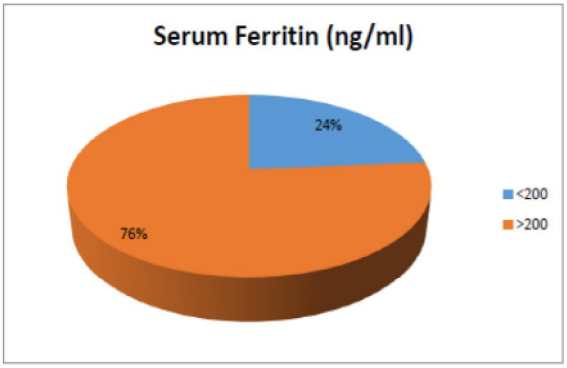

Figure (5): Distribution of the studied PD patients according to serum ferritin level.

Table (7): Distribution of studied PD patients according to serum Albumin level

serum Albumin (gm/dl)		
	<3.5	>3.5
Number (total 21)	15	6
percent	71.4%	28.6%

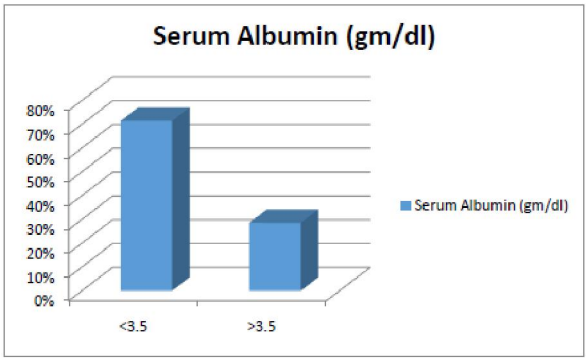

Figure (6): Distribution of the studied PD patients according to serum albumin level.

Table (8): Distribution of studied PD patients according to serum Ca level

Ca (mg/dl)			
	<8.5	8.5-10.5	>10.5
Number (total 21)	11	10	0
percent	52.4%	47.6%	0%

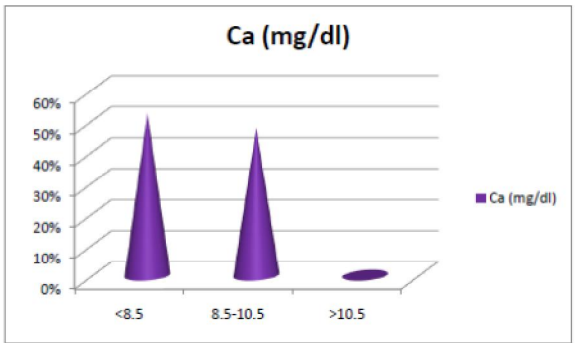

Figure (7): Distribution of the studied PD patients according to serum calcium level.

Table (9): Distribution of studied PD patients according to serum Phosphorus level

Phosphorus (mg/dl)			
	<2.5	2.5-4.5	>4.5
Number (total 21)	0	5	16
percent	0%	23.8%	76.2%

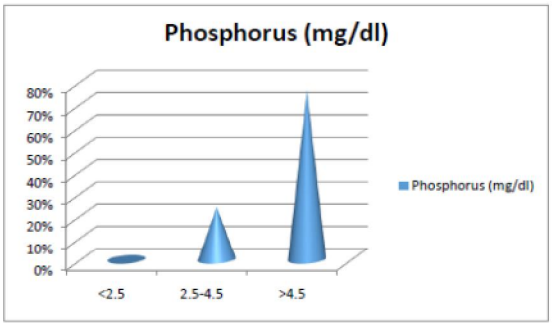

Figure (8): Distribution of the studied PD patients according to serum phosphorus level.

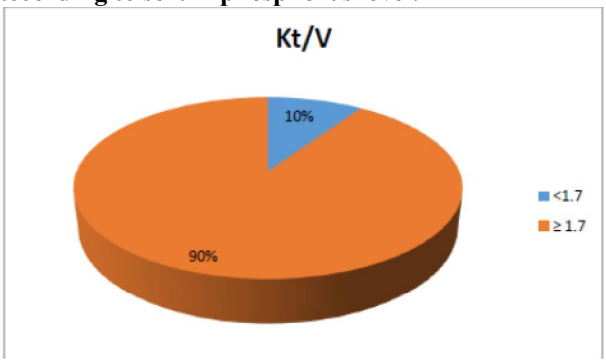

Figure (9): Distribution of the studied PD patients according to Kt/V.

Table (10): Distribution of studied PD patients according to Kt/V

Kt/V		
	<1.7	≥ 1.7
Number (total 21)	2	19
percent	9.5%	90.5%

Dialysis complications:

Table (11): Complications of PD in the studied patients (n=21)

	Number	percentage
Peritonitis at time of study	1	4.76%
Total Peritonitis episodes during last year for all patients	31	1.47 episode/patient/year
Catheter obstruction	2	9.52%
Hyperkalemia	2	9.52%%
Hypokalemia	1	4.76%
hyperphosphatemia	16	76.2%
hypophosphatemia	0	0%
hypercalcemia	0	0%
hypocalcemia	11	52.4%
Other (e.g. Exite site infection, hernia)	1	4.76%

Correlations:

Table (12): Correlation between Hb and other parameters

Variable	Pearson correlation	P value
Age	-0.29	0.9
BMI	-.322	0.15
Albumin	0.168	0.46
PTH	-0.696	**0.0**
Kt\V	.586	**0.005**
Creatinine	0.18	0.44
T SAT	.678	**0.001**
Ferritin	0.636	**0.002**
Ca	0.044	0.851
Po4	-0.482	**0.027**

Table (13): Correlation between PTH and other parameters

Variable	Pearson correlation	P value
Age	-0.163	0.479
BMI	0.186	0.42
Albumin	-0.316	0.164
Hb	-0.696	**0.00**
Kt\V	-0.326	0.15
Creatinine	-0.042	0.856
T SAT	-0.559	**0.008**
Ferritin	-0.462	**0.035**
Ca	-0.287	0.206
Po4	0.5044	**0.02**

WHOQOL-BREF:

Table (14): Bad (< 60) and Good (≥ 60) HRQOL patients according to WHOQOL-BREF results.

Domain	PD patients (n=21)	
Domain 1(physical health)	**n**	**%**
< 60	6	28.6
≥ 60	15	71.4
Domain 2(psychological)		
< 60	**5**	**23.8**
≥ 60	**16**	**76.2**
Domain3(social relation)		
< 60	**4**	**19**
≥ 60	**17**	**81**
Domain4(environment)		
< 60	**7**	**33.3**
≥ 60	**14**	**66.7**

Table (15): Comparison between groups of Bad and Good HRQOL in Domain 1 among studied PD patients.

Domain1 (physical health)	Bad QOL (n=6)	Good QOL (n=15)	Test of significance	P
Mean age	53.6±8.2	47.8±12.5	1.034 ^{t}	0.314
BMI	27.15±1.85	27.22±2.89	-0.53 ^{t}	0.958
PD years	1.83±1.16	1.73±1.38	0.155 ^{t}	0.878
Hb (g\dl)	10.55±2.44	10.33±2.07	0.206 ^{t}	0.839
WCC (x10 ^{9})	7.2±2.19	7.13±1.68	0.075 ^{t}	0.941
Plt (x10 ^{9})	245±33	255±67	-0.018 ^{t}	0.986
T SAT	24.4±6.18	24±8.02	0.136 ^{t}	0.893
Ferritin (ng/mL)	282±96.34	275±88.4	0.142 ^{t}	0.889
S.Ca (mg\dL)	8.01±1.9	8.46±.88	-0.742 ^{t}	0.467
S.Po4 (mg\dL)	55.93±.9	5.7±.38	0.339 ^{t}	0.738
S.Alb (g\dl)	2.83±.49	2.96±.78	-0.385 ^{t}	0.705
iPTH (pg\ml)	611±217	514±244	0.844 ^{t}	0.409
Kt\v	1.9±.12	1.94±.18	0.325 ^{t}	0.749

t: Student t-test for comparing between the two groups P: P values *: statistically significant at P<0.05

Table (16): Comparison between groups of Bad and Good HRQOL in Domain 2 among studied PD patients.

Domain 2 (psychological)	Bad QOL (n=5)	Good QOL (n=16)	Test of significance	P value
Mean age	50±.2.2	49±13.3	0.102 ^{t}	0.92
BMI	26.44±2.4	27.44±2.67	-0.788 ^{t}	0.465
PD years	1.8±1.3	1.75±1.34	0.073 ^{t}	0.942
Hb (g\dl)	10.2±.98	10.45±2.39	-0.229 ^{t}	0.821
WCC (x10 ^{9})	6.82±2.2	7.25±1.7	-0.467 ^{t}	0.646
Plt (x10 ^{9})	246.6±49.7	257.6±62.7	-0.359 ^{t}	0.723
T SAT	25.6±6.5	23.6±7.7	0.495 ^{t}	0.626
Ferritin (ng/mL)	295±27.6	272.1±100.3	0.496 ^{t}	0.626
S.Ca (mg\dL)	8.6±1.14	7.69±1.35	1.292 ^{t}	0.212
S.Po4 (mg\dL)	5.08±1	5.99±1.4	-1.335 ^{t}	0.198
S.Alb (g\dl)	3.36±.727	2.7±0.6	1.639 ^{t}	0.118
iPTH (pg\ml)	537±271.5	543.75±233.3	-0.54 ^{t}	0.957
Kt\v	1.96±0.114	1.94±0.182	0.186 ^{t}	0.854

t: Student t-test for comparing between the two groups
P: P values
*: statistically significant at P<0.05

Table (17): Comparison between groups of Bad and Good HRQOL in Domain 3 among PD studied patients.

Domain 3 (social relation)	Bad QOL (n=4)	Good QOL (n=17)	Test of significance	P value
Mean age	49.5±3	49.52±12.93	-.004 ^{t}	0.997
BMI	27.05±2.11	27.24±2.74	-.127 ^{t}	0.9
PD years	1.75±1.5	1.76±1.3	0.02 ^{t}	0.987
Hb (g\dl)	9.77±0.65	10.54±2.33	-0.638 ^{t}	0.531
WCC (x10 ^{9})	6.42±2.26	7.32±1.69	-0.9 ^{t}	0.38
Plt (x10 ^{9})	234±52.3	259.8±60.8	-0.758 ^{t}	0.458
T SAT	24.25±4.57	24.11±8.03	0.031 ^{t}	0.975
Ferritin (ng/mL)	313±42.6	269±94	0.9 ^{t}	0.379
S.Ca (mg\dL)	7.85±2.4	8.44±.88	-0.847 ^{t}	0.393
S.Po4 (mg\dL)	5.87±1.13	5.74±1.42	0.166 ^{t}	0.87
S.Alb (g\dl)	3.2±0.75	2.86±0.69	-0.853 ^{t}	0.404
iPTH (pg\ml)	713±221	501±226	1.692 ^{t}	0.107
Kt\v	1.95±0.057	1.94±0.184	0.031 ^{t}	0.976

t: Student t-test for comparing between the two groups, P: P values *: statistically significant at P<0.05

Table (18): Comparison between groups of Bad and Good HRQOL in Domain 4 among PD studied patients.

Domain 4 (environment)	Bad QOL (n=7)	Good QOL (n=14)	Test of significance	P value
Mean age	53.71±10.78	47.42±11.84	1.179 ^{t}	0.253
BMI	26.83±2.05	27.39±2.87	-.46 ^{t}	0.651
PD years	1.57±1.33	1.85±1.4	-0.465 ^{t}	0.647
Hb (g\dl)	10.78±2.53	10.2±1.96	.585 ^{t}	0.566
WCC (x10 ^{9})	6.2±1.84	7.6±1.61	-1.823 ^{t}	0.084
Plt (x10 ^{9})	227±22.1	268±66.9	-1.602 ^{t}	0.126
T SAT	25.42±7.45	23.5±7.56	0.553 ^{t}	0.587
Ferritin (ng/mL)	274±105.1	279±82.9	-0.107 ^{t}	0.916
S.Ca (mg\dL)	8.54±0.82	8.22±1.39	0.546 ^{t}	0.592
S.Po4 (mg\dL)	5.68±1.38	5.81±1.38	-0.2 ^{t}	0.843
S.Alb (g\dl)	2.98±0.67	2.9±0.73	0.257 ^{t}	0.8
iPTH (pg\ml)	555±187	535±263	0.174 ^{t}	0.863
Kt\v	1.97±0.13	1.93±0.18	0.455 ^{t}	0.654

t: Student t-test for comparing between the two groups
P: P values *: statistically significant at P<0.05

4. Discussion:

Peritoneal dialysis has been successfully used in many developing countries, such as Mexico, but the modality is much underutilized in the developing world. This is due to a variety of reasons but there are some common challenges. One is that patients may not be well educated and compliant. A hot humid climate and poor hygienic conditions increase the risk for peritonitis **[9]** as Tropical regions were associated with a higher overall peritonitis rate (including fungal peritonitis) and a shorter time to a first peritonitis episode **[10].**

Although there is a perception that the use of peritoneal dialysis is declining worldwide, compilations of global data are unavailable to test this hypothesis. A study assessed longitudinal trends in the use of peritoneal dialysis from 1997 to 2008 in 130 countries. In 2008, there were approximately 196,000 peritoneal dialysis patients worldwide, representing 11% of the dialysis population. In total, 59% were treated in developing countries and 41% in developed countries. Over 12 years, the number of peritoneal dialysis patients increased in developing countries by 24.9 patients per million population and in developed countries by 21.8 per million population. The proportion of all dialysis patients treated with peritoneal dialysis did not change in developing countries but significantly declined in developed countries by 5.3%. The use of automated peritoneal dialysis increased by 14.5% in developing countries and by 30.3% in developed countries. In summary, the number of patients treated with peritoneal dialysis rose worldwide from 1997 to 2008, with a 2.5-fold increase in the prevalence of peritoneal dialysis patients in developing countries. The proportion of all dialysis patients treated with this modality continues to decline in developed countries **[11].**

Importantly, in some developing countries, such as Egypt, there is a relatively high cost of CAPD in comparison to HD. A study comparing the HD and PD cost in 46 countries (20 developed & 26 developing) found that the cost of HD was between 1.25 and 2.35 times the cost of PD in 22 countries (17 developed and 5 developing), between 0.90 and 1.25 times the cost of PD in 15 countries (2 developed and 13 developing), and between 0.22 and 0.90 times the cost of PD in 9 countries (1 developed and 8 developing). It was evident that most developed countries can provide PD at a lesser expense to the healthcare system than HD. The evidence on developing countries is more mixed, but in most cases PD can be provided at a similar cost where economies of scale have been achieved, either by local production or by low import duties on PD equipment **[12].**

There was a motivation to start the first CAPD program in Egypt in 1997. Actually, PD had had a bad image for some time in Egypt, as many patients and doctors were only aware of intermittent PD whereby terminal patients were dialyzed two to three times per week for at least 18 hours each time, via rigid and often painful catheters, with most patients eventually dying from peritonitis. So initially only educated and motivated patients were accepted onto this program so as to provide a good image in the hope that those patients would help deliver the message that CAPD is a good modality for RRT in Egypt. Over 10 years, this small program has treated 33 patients, 11 of whom are still on CAPD. Not surprisingly, the same excellent results that have been seen in similar countries were achieved. The rates of peritonitis, exit-site infection, catheter complications, technique failure, and death do not exceed internationally accepted rates **[13].** Culture-negative peritonitis was found in 49% of patients, which is higher than internationally recommended

(20%) **[13].** With respect to the adequacy of dialysis, the program achieved the ISPD recommendation and the European Best Practices Guidelines that suggest a minimum weekly target Kt/V urea of 1.7 **[14].**

In Egypt, there are no recent data about the prevalence of ESRD; However, the last statistics was performed in 2004, with a prevalence of 483 pmp **[15]** while in USA prevalence is 2128 pmp **[17].**

The present study spot light on the clinical & laboratory characteristics and complications of ESRD patients on PD in 2 main PD Egyptian centers.

In the present study the mean age of PD patients was49.5+-11.63 years. This is consistent with Afifi, 2008, who reported the mean age increased from 45.6 years to 49.8 years in Egypt from the year 1996 to 2008. This change reflects the improvement of health care **[15].** The current results are in contrary to the study performed by Jungers et al, who reported that ESRD dramatically increases with aging in both genders, and also with another study performed by Yu et al who reported an increase in the prevalence of CKD with ageing, particularly after 50 years in both genders **(Yu et al., 2010) [19]** the mean age in the United State was 61.1 years **(USRDS, 2011) [16]** and the median age in the United Kingdom was 65.9 years Such differences between the current study and other studies on the impact of variables such as gender and age could be due to genetic or social differences between the Egyptian community and other communities.

Most of our patients are females 76.2%, which does not reflect the overall gender distribution of ESRD in Egypt, where the male gender predominates according to 9th Annual Report of The Egyptian Renal Registry provided by Egyptian Society of Nephrology and Transplantation (ESNT), (Males represented 55.2 % while females were about 44.8 %.) **[15].**

In the United States, male gender represents 57.31% of patients undergoing dialysis **[16].** This variation may be due to the small number of patients included in the study.

The main cause of ESRD in our study was hypertension representing 42% of patients followed by diabetes. Several studies were conducted in the world that showed that elevation of blood pressure is a strong risk factor of ESRD. In a study in the Netherland, diabetes was the 2nd cause of ESRD following hypertension**.** In USA Renal Registry the leading cause of ESRD was diabetes followed by hypertension **[16].**

In this study, the prevalence of hepatitis C was 28.6%. The prevalence of hepatitis C in dialysis patients showed wide variations worldwide. It was estimated to be 52.1% in Egypt **[15].**

Hemoglobin percent mean was 10.39 ± 2.12 gm/dl and this reflects most probably the proper use of ESA and iron therapy and the absence of blood loss that is seen in HD patients.

The study showed significant negative correlation between hemoglobin and PTH which is consistent with Keshk et al. **(Keshk et al., 2016).** Transferrin saturation was above 20% in 76.2% of patients and this can be a result of proper use of ESA and iron therapy and absence of blood loss. The advantage of continuous PD which is improving blood count more effectively compared to intermittent procedures, as hemoglobin levels are significantly higher in patients with comparable iron stores**.**

Serum albumin was lower than 3.5 gm/dl in 71.4% of patients. The serum albumin of PD patients is lower than that of HD patients – this is mostly secondary to daily peritoneal protein losses. Hypoalbuminemia predicts an increased risk of not only cardiovascular but also infection-related mortality in PD**.** In USA42.8% of PD patients were hypoalbuminemic (<3.5 g/dl).

Regarding serum calcium level, none of patients had hypercalcemia. Hypocalcemia was found in 52.4% while normal calcium level was found in 47.6% whereas in the USA 23.9% of PD patients had calcium levels less than 8.4 mg/dl and 2% had calcium level above 10.2 mg/dl.

Weekly Kt/v > 1.7 was achieved in 90.5% of patients and this is slightly better if compared with the weekly Kt/v in USA PD patients where 88.9% had Kt/v less than 1.7**[16].**

In CAPD patients, hyperkalemia is less common than hypokalemia. In a local study by Szeto et al., the prevalence of hyperkalemia in a cohort of 266 patients was 3%, much lower than the prevalence of hypokalemia (20.3%) (Szeto et al., 2005). In our studied patients, hypokalemia represents 4.76 % while hyperkalemic patients was 9.52% and the rest had normal K level. This could be explained by that peritoneal dialysis fluid contains no potassium, and a typical continuous ambulatory PD (CAPD) regimen of 8 L eliminates approximately 40 mmol potassium daily**.**

Hyperphosphatemia was prevalent in our studied patients (76.2%) and this is consistent with Bernardo et al., who stated that Hyperphosphatemia is highly prevalent in PD patients and is a strong predictor of overall and cardiovascular mortality**.** As all our studied patients were anuric, phosphate elementation became harder and hyperphosphatemia became more prevalent.

Peritonitis is a common and serious complication of peritoneal dialysis (PD). Although less than 5% of peritonitis episodes result in death, peritonitis is the direct or major contributing cause of death in around 16% of PD patients**.** Perritonitis rate in this study was 1.47 episode/patient/year. The overall peritonitis rate

should be no more than 0.5 episodes per year at risk, although the rate achieved depends considerably on the patient population. In some outstanding centers, an overall peritonitis rate as low as 0.18 to 0.20 episode per year has been reported and **[10].**

Quality of life assessment of patients with CKD and ESRD not only helps to assess the quality of dialysis program but also is very helpful to guide nephrologists to develop better interventions and future plans for care of patients**.**

It is recognized that regardless of the treatment modality, patients suffering from ESRD have to cope with many adversities, e.g. physical symptoms, dietary regimes and body image changes, while their control over treatment and these adversities cannot always be predicted**.**

According to scores of each domain of WHOQOL-BREF questionnaire 6 patient in our study Egyptian PD patients had bad score for QOL in the physical health domain (domain 1) while the rest (15 patients) had good QOL representing 28.6% and 71.4% respectively. This is not similar to Egyptian HD patients and this could be attributed to the selection criteria for PD patient that emphasize for the need good home facility, isolation part of home and high educated care giver and patient to ensure strict aseptic PD connection and disconnection. Their HRQL is still much lower than general population**.**

Bad quality of life in physical domain of PD patients was seen in patients with lower albumin level and this is consistent with Mittal et al who stated that compromised physical well-being in CAPD patients has been reported in connection with lower levels of albumin. Moreover compromised physical wellbeing is associated with patients with health problems as peritonitis**.**

According to domain 2 (psychological), 76.2% of patients have good QOL. This could be due to that the peritoneal treatment modality offering increased autonomy and control, flexibility in everyday life and the dietary regime, as well as fewer social restrictions. This also can explain why QOL is better in PD than HD patients regarding psychological domain **[17]**.

In domain 3 (social) 81% of patients demonstrate score of good QOL. This ratio could be better if patients were not all been switched from HD to PD as what was observed by Joshi et al who stated that a significantly lower QOL score is present in social domain in patients who had undergone dialysis for more than 5 years than patients dialyzed for shorter duration**.** Also, Yang et al found similar results and correlated patients with the low score in the social domain with dissatisfaction with sexual life and feeling less respected**.**

The environmental domain (domain 4) possesses the lowest percentage of good QOL among all domains 66.7% and this could be attributed to low finances and most of our studied patients are unemployed uneducated housewives.

In the present study, the mean of HRQOL scores were relatively higher in younger age groups in all domains, yet there was no statistically significant difference. The association of age with HRQOL is quite complex and illustrates the complexity of the QOL concept **[19].** Some studies conducted in different countries also demonstrated that age was strongly inversely associated with the physical domain scores. As age increases in the elderly, physical function of the body decreases **[20] [21]**. Several studies have shown that patients with CKD undergoing hemodialysis have a lower QOL than those undergoing peritoneal dialysis**.**

The PD faced — and is still facing — many handicaps. One of these is the ignorance of patients about PD. Also, many nephrology doctors and nurses are often unaware of PD and are preoccupied with peritonitis so that they were not only not recommending PD but actually discouraging its application.

Egypt was confronted with the high cost of PD solutions and other equipments in comparison with HD in Egypt. The Egyptian Ministry of Health do not consider the cost of dialysis places, medical personnel, patient transportation and patients' absence from work in the calculation of the total cost HD, hence the cost of HD is much less then PD.

Conclusion:

In conclusion, our study revealed that all patients were not offered PD as a modality of RRT until they had vascular access failure.

Hypertension was the most common cause of ESRD in these patients while low albumin and catheter related problems were the most common problem and complications.

Lack of education, financial problems and unemployment were important factors that affect QOL on our patients. Although our patients QOL is lower than normal population but is higher if compared with those of HD.

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