Clinical Outcomes of Peritoneal Dialysis Patients in Benghazi Children Hospital

Jebril S. Elabidi, Mariam Burgia, Mohamed O. Ezwaic

ABSTRACT
Peritoneal dialysis (PD) is an important replacement therapy option for children, who have reached Pediatric end stage renal disease (pESRD). Providing therapy with desired clearance of uremic toxins and maintaining social and personal privacy of this sector of patients, who suffer a lot when receiving in center chronic hemodialysis on a thrice weekly basis. We analyzed data from 21 PD patients during the period between 2008 and 2016. The collected data included demographic data such as gender, age, causes of pESRD, history of peritonitis episodes, and cause of death. Male to female ratio was 1.3:1; mean age at diagnosis was 2.7 ± 3.9 years. Continuous ambulatory peritoneal dialysis (CAPD) was recorded in 14.3%, while automated peritoneal dialysis (APD) was recorded in 85.7%. All patients had episodes of peritonitis except one. The causative agent was Pseudomonas aeruginosa in 9.5% of the episodes, Staphylococcus aureas in 8.8%, while culture negative peritonitis was recorded in 85.7% of cases. Mortality Outcome of our PD patients revealed an annual death rate of 21.1%. Despite a frequency of uncomplicated peritonitis of 10.3%, there was a significant annual death rate in our PD patients. These outcomes are not unusual in PD practice, but they mandate that we revise our current practice of PD in the pediatric population, focusing on proper patient selection, improving family and nurse training and involvement, to strive with the flexible and valuable mode of pESRD therapy to improve the patient’s condition, until kidney transplant for the affected child is feasible.

Keywords: Pediatric end stage renal disease, Peritoneal dialysis, Peritonitis, Annual death rate
Received: 15 August 2018
Accepted: 12 October 2018

INTRODUCTION
Patients with pediatric end stage renal disease (pESRD), experience the entire spectrum of renal replacement therapy (RRT) including hemodialysis (HD), peritoneal dialysis (PD), and kidney transplantation (KTx). In children with pESRD, peritoneal dialysis is the most common initial modality of treatment in children less than nine years of age, or with less than twenty kilograms of body weight. But among those with pESRD, 70% of the pediatric population are living with functioning kidney transplants (1). Pediatric expert groups in Europe and the United states state that, the cut off point for starting renal replacement therapy (RRT) in the pediatric age group should be when the estimated glomerular filtration rate (GFR) decreases to 10-15 ml/mim/1.73m2, probably to avoid neurodevelopmental delay in those children and infants (2).
There are several advantages of providing maintenance peritoneal dialysis (PD) over hemodialysis (HD) to the pediatric age group, including better preservation of residual renal function, less dietary restrictions, avoidance of vascular access, and home-based therapy lessening the disruption of the child's school activities (3). The current study was conducted to study the current practice of PD in our nephrology unit at Benghazi Children Hospital, and its associated outcome over eight years.

OBJECTIVES
We aimed to study the course of children who received peritoneal dialysis (PD) at the Nephrology Department of Benghazi Children Hospital, Benghazi Libya, from January 2008 to December 2016. A total of 21 children (12 boys and 9 girls) with end-stage renal failure (ESRF) received PD. We also aimed to present our experience in peritoneal dialysis with demographics, clinical and biochemical outcomes, and factors affecting mortality in ESRD patients treated with peritoneal dialysis at our center with controlled clinical outcomes.

MATERIAL and METHOD
We analyzed data from 21 PD patients during the period between 2008 and 2016. The collected data included demographic data such as gender and age, causes of PD, complications, history of peritonitis, outcome, and cause of death. The data was entered into a specially designed questionnaire appendix 1. Statistical analysis data were analyzed using the Statistical Package for Social Science.
RESULTS

Male to female ratio was 1.31, mean age at diagnosis was 2.7 ± 3.9 years (Figure 1). Causes of renal failure were bilateral hypoplastic kidney in 19%, congenital nephrotic syndrome in 14.3% of patients, bilateral vesicoureteral reflux, poly cystic kidney, renal tubular acidosis and glomerulonephritis 9.5% each, IgA nephropathy, right kidney agenesis and hereditary glomerulonephritis 4.8% each (Figure 2). Positive family history of same disease was recorded in 52.4% patients. Same disease was recorded in 50% of brothers, continuous ambulatory peritoneal dialysis (CAPD) was recorded in 14.3%, while automated peritoneal dialysis (APD) was recorded in 85.7% (Figure 3). Peritoneal dialysis was performed by mothers in 76.2% Complications of PD such as hernia was recorded in 19% of patients, all patients had uncomplicated episodes of peritonitis except one, with pseudomonas aeruginosa in 9.5% of episodes, staphylococcus aureus in 4.8%, while culture negative peritonitis was recorded in 85.7% of cases (Figure 4). The mortality outcome of our PD patients was an annual death rate of 21.1%. The cause of death was acute volume over load in 22.2%, peritonitis in 10.3%, severe hypertension in 11.9%, while miscellaneous causes: hypovolemic shock, bronchopneumonia and acute gastroenteritis occurred in 45.3%. Further follow up of the children who survived revealed that 23.8% have continued on peritoneal dialysis, 14.3% on hemodialysis, 9.5% have had a kidney transplant, 4.8% stayed without dialysis and 4.8% had peritoneal dialysis and hemodialysis.

DISCUSSION

The study included 21 patients on peritoneal dialysis, more than half (57%) of the patients was male and 43% were female, with male to female ratio 1.31. Similar results obtained from another study included 9 boys and 6 girls, male to female ratio 1.51 (4). The mean age of patients was 9.2± 5.5 years, minimum age was 2 years and maximum was 22 years, age <5 constituted 38.1%, age groups 6-10 years, and 11-15 years were 23.8% each, age group 16-20 years was 9.8% and >20 was 4.8%. The majority of patients (90.5%) were Libyan. In a Saudi Arabian study out of 15 patients 8 (53%) were Saudi Arabian, and the rest were from different nationalities. (4) More than half (71.4%) of patients were from Benghazi, and 28.6% from outside Benghazi. The age at diagnosis ranged between 8 years to 14 years, mean age was 2.7 ± 3.9 years. 57.2% of the patients were aged below one year, ages 1-5 and 6-10 were 19% each, while age 11-15 constituted 4.8% of the patients. The age at the start of dialysis ranged from one month to 14 years. A mean of 6.8 ± 4.3 years, age between 1-5 years constituted 47.6%, age 6-10 years 19%, age 11-15 years 28.6%, and age <1 years 4.8%. The age at start of dialysis ranged from one month to 16 years. A similar result was recorded in another study where it was found that the mean age of the children at the start of PD was 7.3 ± 4.3 years. (4) While others found the mean age at the beginning of dialysis was 3.96 years (range: two days - 16 years). (5) Most of deaths occurred one year following commencement of PD.

Etiologies of renal failure were bilateral hypoplastic kidney in 19%, congenital nephrotic syndrome in 14.3% of patients, bilateral vesicoureteral reflux, polycystic kidney, renal tubular acidosis and glomerulonephritis 9.5% each, IgA nephropathy, right kidney agenesis and hereditary glomerulonephritis 4.8% each. In another study the etiologies of chronic renal failure (CRF) were congenital abnormalities of the renal system in four patients; one had renal dysplasia, two had posterior urethral valve and one had primary vesico-urethral reflux. Three other patients had inherited diseases; one had congenital nephrotic syndrome; one had cystinosis, and one had familial hypomagnesaemia hypercalciuric nephrocalcinosis syndrome (FHHNC). Six other children had acquired causes of CRF, three had steroid resistant nephrotic syndrome, two had rapidly progressive glomerulonephritis (RPGN) and one had cortical necrosis following cardiomyopathy caused by using adriamycin for neuroblastoma. While in a similar study the most common cause of end-stage renal disease was glomerular disease (in 43.3%). High blood pressure was present in 57.1%, vomiting in 33.3%, oedema in 28.6%, acidosis in 23.8%, pulmonary oedema in 19% and anuria in 9.5% of the patients. A positive family history of the same disease was recorded in 52.4% patients. Same disease was recorded in 50% of brothers, 30% of sisters and 10% of other relatives. History of consanguinity was recorded in 57% of the patients. A high socioeconomic status was reported in 28.6%, average in 33.3% and low in 38.1%. Mean weight was 16.9±2.9 kg, ranging between 12.5 and 22.6 kg. Underweights constituted 57% of the patients and 43% were in the normal range. A study from Saudi Arabia documented that poor growth is usually observed in a child with chronic renal failure (CRF). Short stature was recorded in 81% of the patients. In another...
study the patients were severely growth retarded with the mean height standard deviation score (Z score) of -3.3 ± 2.1 and mean body mass index (BMI) of 15.9 ± 1.9. (7) There were two types of dialysis, continuous ambulatory peritoneal dialysis (CAPD) which used by 85.7% (18 patients) and automated peritoneal dialysis (APD) used by 14.3% (3 patients) of. In another study 11 children received continuous ambulatory dialysis and four received automated PD. (7) The person who performed the peritoneal dialysis was the mother in 76.2%, the father in 14.8%, a sister in 4.8%, and by both mother and father in 4.8%. In a similar study, peritoneal dialysis at home was performed in all the cases by mothers except in two patients; one had the father's help and one had a maid's help. (4) The Level of education of person performing the peritoneal dialysis was high in 38% of patients and low in 62%. In the one patient who had no history of peritonitis the level of education of person performing the peritoneal dialysis was low. In another study the dialysis providers for five (33.3%) children were educated (finished high school), for five (33.3%) they had minimal education and for the remaining five (33.3%), the dialysis providers were illiterate. They also found that illiteracy was higher and a separate room was less available in the peritonitis group compared to the peritonitis free group (37.5% vs 14.3% and 50% vs 100%, respectively).

(4) Peritonitis is almost the most frequent complication of peritoneal dialysis, peritonitis is also the most important determining factor of mortality-morbidity. The number of peritonitis episodes ranged from 2 to 30 times. 19% of patients peritonitis twice, 14.3% had three, four and five times each. Six episodes were recorded in 9.3%. Seven, ten, fourteen, fifteen and thirty times were recorded in 4.8% of patients, while 4.8% (one patient) had no peritonitis. The latter patient had eight siblings, and dialysis was not done in an isolated room. A study from Saudi Arabia found that the there was no difference in number of siblings, between the eight children who had peritonitis and the seven children who did not have peritonitis. The overall rate of peritonitis was one episode per 5.9% patients treatment months. Five children had recurrent peritonitis, only one patient had none. The dialysate volume at start of dialysis ranged between 30 ml - 50 ml/kg, the lowest volume was 40 ml and the highest was 280 ml / session. Hernia was considered the complication of PD. A history of inguinal hernia was positive in 19% of patients, these were two males and two females. In a study by others it was documented that hernias were most frequently inguinal and the incidence was higher in young males. The major cause is increased intra-abdominal pressure. Another study showed a relatively lower rate of hernia (8.7%). A history of hydrocele was obtained in 4.8% of patients. In a similar study the most frequent surgical complications were hernia (inguinal in 15, umbilical in eight, and incisional in two), and leakage in 18 patients. Fourteen patients had bleeding after surgery, hydrocele appeared in five. (5) Peritoneal dialysis was done in an isolated room in 66.7% of patients and 33.3% of patients were not isolated. In a Saudi Arabian study 11 (73%) children had the dialysis performed in a separate room spared for this purpose and the remaining four had it done in the living room of the family because of inadequate residential space. (4) The number of siblings ranged from 1 to 8, with a mean 4 ±1.8. 85.7% of patients had ≤ 5 siblings and 14.3% had > 5 siblings. Peritoneal fluid culture was positive in 14.3% of patients, 9.5% had Pseudomonas aeruginosa and 4.8% had Staphylococcus aureus, while the growth was negative in 85.7%. Results of a study from Saudi Arabia found that gram negative bacteria were the cause of peritonitis in 43.5% of the cases, gram positive in 30.4%, fungi in 8.9% and unknown in 17.4%. (4) A history of catheter obstruction was present in 19% of patients. In a similar study PD catheters were removed in five children; four because of infection and one because of obstruction. (4) A history of failed peritoneal dialysis was present in 9.5% of the patients. KT/V was low in 85.7% and within normal in 14.3%. In the United States it is advised that dialysis should be commenced when the KT/V of the native kidneys is < 2.0. However, most authorities define adequate dialysis as a KT/V of 1.0 in HD per session and 1.9/week in PD. (8) All patients had a urea level above 40 mg/dl, mean level 185.1±68.1 mg/dl, with median equal to 185.2
mg/dl and the level ranged from 76 mg/dl to 413.8 mg/dl. The result of another study was a mean blood urea of 210 ± 15 mg/dl. All patients had a creatinine level more than one with a mean 8.3 ± 3.4 mg/dl, the minimum level was 2.3 mg/dl and maximum 15.4 mg/dl. A similar result was obtained from another study where the serum creatinine was 9.1 ± 0.3 mg/dl (5). The level of sodium was < 135 mEq/l recorded in 33.3% and ranged between 135 and 145 (in 66.7%). The mean level of sodium was 134.9 ± 5.3 mEq/l with a minimum level equal to 116.44 mEq/l and maximum level 141.54 mEq/l. Hypernatremia or hypot natremia were considered as metabolic complications. In another study only one patient had hypotnatremia before PD which persisted after PD, but no patient had newly developed hypotnatremia. More than half of the study patients had a potassium level between 3.5 and 5 mEq/l and 43% had > 5 mEq/l. The mean level of potassium was 5.3 ± 1.9 mEq/l, and ranged from 3.9 and 13.2 mEq/l. Hyperkalemia or hypokalemia were also metabolic complications. In a similar study hypokalemia was recorded in 6.3% (6). More than half of the patients (57.2%) had a calcium level between 8.5 and 10.5 mg/dl. 33.3% had a calcium level of < 8.5 mg/dl and 9.5% had a level of > 10.5 mg/dl. The mean calcium level was 8.8 ± 1.2 mg/dl, with a range from 6.5 to 10.8 mg/dl. Hypercalcemia or hypocalcemia were also rated significant metabolic complications. The phosphate level ranged between 4 to 1.9 mg/dl, with a mean of 8.742 ± 6.6 mg/dl. The majority of patients (95.2%) had phosphate level of > 5.5 mg/dl, while 4.8% were < 4.5 mg/dl. The majority of patients (81%) had a level of serum albumin between 3.3 and 5.5 g/dl, while 19% had a level below 3.3 g/dl. The mean level was 3.7 ± 0.59 g/dl, with a minimum level of 2.3 g/dl and maximum level of 4.8 g/dl. The level of serum cholesterol ranged between 170 to 200 mg/dl (19% patients). 57% of patients had a level of < 170 mg/dl and 24% of patients had a level of > 200 mg/dl. The mean level was 181.8 ± 52.7 mg/dl with range between 115.7 and 289.5 mg/dl. The level of serum iron was between 50 to 120 mg/dl in 66.7%. A level below 50 mg/dl occurred in 23.8% and a level of more than 120 mg/dl in 9.5%, with a mean level of 77.5 ± 28.6 mg/dl and range between 36 mg/dl and 124 mg/dl. In a similar study seven patients were put on oral iron supplements; one of whom was switched to intravenous iron replacement subsequently due to functional iron deficiency (10). The white blood cell count in all patients was between 4.15 ± 109/L. The mean count was 9.5 ± 109/L ± 2.4 ± 109/L, the median was 9.1 ± 109/L, and the minimum count was 6.1 ± 109/L and maximum count 14.1 ± 109/L. All females had a hemoglobin level below 12 mg/dl, with a mean level of 8.9 ± 1.3 mg/dl (minimum level 7.1 mg/dl and maximum level 10.8 mg/dl). All males had hemoglobin levels below 14 mg/dl. In another study most of the patients had anemia (7). Other studies documented that a higher hemoglobin level is maintained in PD perhaps because of better clearance of uremic toxins that inhibit hemoglobin synthesis and erythropoietin production, increased efficacy of erythropoietin, effective erythropoiesis, and higher red cell survival (11). Platelet counts between 150 and 450 ± 109/L constituted 85.7%, while 4.8% < 150 ± 109/L and 9.5% > 450 ± 109/L, with a mean level of 299.5 ± 89.5 ± 109/L (minimum level 109.5 ± 109/L and maximum 462 ± 109/L). The majority of patients (90.5%) had a parathyroid hormone level of > 55 pg/ml, the mean value was 430 ± 22.8 pg/ml, with a minimum level of 12.7 pg/ml and maximum 1086 pg/ml. In another study it was found that all patients had a markedly elevated mean PTH (90-111 pmol/L) outside the recommended target range (10) [With regard to disease outcome 9 patients (42.8%) died, 23.8% continued peritoneal dialysis, 14.3% hemodialysis, 9.5% had a kidney transplant, 4.8% stayed without dialysis, and 4.8% had peritoneal dialysis and hemodialysis. In a Saudi Arabian study the results revealed that three children were shifted to hemodialysis perma-
Fibrodysplasia ossificans progressiva, “Stone Man Syndrome”

Fibrodysplasia ossificans progressiva (FOP) is a progressive genetic disorder that turns soft tissues into bone over time. The ACVR1 gene found in bone, muscles, tendons, and ligaments regulates growth and development of those tissues, and is normally responsible for turning cartilage into bone as children develop. However, mutations of this gene can allow ossification to go unchecked throughout a sufferer’s life, even turning skeletal muscle into bone and causing joints to fuse together. This disorder occurs in about 1 in 2 million people, and there are currently no treatments or cures. Trauma exacerbates the condition, so attempts to remove bone surgically just results in the body producing even more bone in the area.

Joh-co via Wikimedia Commons
A Tattoo Sparks An Ethics

A Florida man's unusual tattoo sparked an ethical debate among his doctors. The man, who arrived unconscious at the hospital, had the words "do not resuscitate" tattooed on his chest.

His doctors were torn: Should they honor the tattoo, without an official "do not resuscitate" (DNR) order? Or should they plan to resuscitate the man anyway, since they were uncertain if the tattoo really reflected his wishes?

A medical ethics expert advised the doctors to honor the patient's tattoo, because it was reasonable to assume the tattoo "expressed an authentic preference."

Later, the hospital found that the man actually did have an official DNR order with the Florida Department of Health. The man's condition soon deteriorated, and he died without undergoing CPR or invasive life-support methods, according to his wishes.

A report of the case was published Nov. 30 in The New England Journal of Medicine.

The Question Is:
When Do We Start Such Debates?