Original Article

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# Peritoneal dialysis in Iraq: Past and the modern era

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**ABSTRACT**

**Background**: The peritoneal cavity, a region of the abdomen, receives dialysate, a cleansing solution, via a catheter tube. The dialysate removes waste from blood vessels in the peritoneum; subsequently, the fluid is removed from the body and disposed of. Benefits of chronic PD include reduced costs, home-based therapy, single access, a decreased need for highly skilled workers and large infrastructure. **Aim**: This study aimed to assess the prevalence and outcomes of acute and chronic PD in the Iraqi population. **Methods:** We have gathered data regarding every patient who received acute and chronic peritoneal dialysis in Iraq in period between 2016-2024 to know the prevalence and mortality rate.450 patients with end stage renal disease undergo chronic peritoneal dialysis in AL-Najaf center. 950,459,74,23 patients have acute peritoneal dialysis in children welfare teaching hospital. Mosul,AL-Nasyrea and AL-Basra centers respectively. **Results**: Among the subjects, 450 patients underwent chronic dialysis at the Al-Najaf center, with a mortality rate of 41%. Sepsis and cardiac disease were the most common causes of death. Four percent underwent kidney transplant, and 18% were transferred to hemodialysis. Regarding acute pediatric PD, a high rate of complete recovery was observed at the Children Welfare Teaching Hospital and Mosul, Al-Nasyrea, and Al-Basra centers, with rates of 72%, 83%, 70%, and 48%, respectively. The death rates in these centers were 25.7%, 16.7%, 29.7%, and 26%, respectively. **Conclusions**: The findings demonstrate that infection and cardiovascular diseases are the most common causes of death in adult CAPD patients; a high recovery rate can be achieved from acute peritoneal dialysis in children; and limited access to CAPD solutions complicates practice.

**Keywords**: peritoneal dialysis, AKI, CAPD

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## INTRODUCTION

### Peritoneal Dialysis

A catheter tube delivers dialysate, a cleansing solution, to the peritoneal cavity, a region of the abdomen. Waste products from blood vessels in the peritoneum are subsequently removed from the body.[1, 2]

The management of end-stage renal disease (ESRD) and acute kidney injury (AKI) can be achieved through various renal replacement therapy (RRT) options. The most prevalent type of RRT used in developed countries is hemodialysis, while peritoneal dialysis is gaining popularity in underdeveloped regions.

Benefits of chronic peritoneal dialysis (PD) include reduced costs, home-based therapy, single access, a decreased need for highly skilled workers and large infrastructure, the ability for a single nephrologist to treat more patients, and potentially improved mobility and quality of life.

Patients with AKI in developing countries, where access to facilities for other types of RRT is limited, have found PD to be life-saving in managing their condition. There are guidelines available from the International Society of Peritoneal Dialysis regarding the use of PD in AKI have helped maintain consistency. Additionally, PD has been effectively employed in unique cases of AKI caused by poisoning, malaria, febrile illnesses, snake bites, and cardiac surgeries in critically ill children experiencing multiple organ dysfunction, shock, infection, and sepsis, particularly in isolated and underdeveloped areas.

Globally, hemodialysis is the most common form of RRT used in ESRD; however, some countries have started implementing a "PD first" policy to reduce RRT healthcare costs and ensure access for underprivileged populations.[3,4]

Dr. Mahmood Thamer, a pediatrician, performed the first acute intermittent PD on a 14-year-old boy in June 1967 at Medical City Hospital following a case of vibriosis[5] in a personal conversation with Professor Amera Shubber, a physician.

The following are the indications of PD:

1. Uremic encephalopathy
2. Uncontrollable acidosis
3. Electrolyte disturbances (hypernatremia, hyponatremia)
4. Anuria
5. Acute chronic renal failure[5]

Compared to conventional hemodialysis, PD usually produces less small-molecule clearance. This is because, after one hour of PD, the concentration of small molecules in peritoneal dialysate ranges from 30% to 50% of matching serum values, and 50%–80% after four hours of dwell time. On the other hand, continuous PD leads to higher clearance of solutes with a higher molecular weight.[6,7]

When the concentration of glucose reaches its peak, At the beginning of a PD exchange, the ultrafiltration rate reaches its maximum when the concentration of glucose peaks. An additional decrease in the ultrafiltration rate occurs as glucose is absorbed and its concentration falls further due to the ultrafiltrate moving into the peritoneal cavity. The intraperitoneal volume of ultrafiltrate peaks between 120 and 180 minutes after dwell.[8]

**Peritoneal dialysis in AKI**

In critically ill patients and the aging population in poorer nations, AKI is a leading cause of morbidity and mortality. Thirty percent of patients admitted to the intensive care unit (ICU) experience sepsis, cardiorenal syndrome, and hemodynamic instability. Hemodialysis (HD), continuous renal replacement therapy (CRRT), and acute PD—either manually or with an automated machine in advanced centers. Due to its affordability, PD is frequently used in rural areas where access to power, clean water, and medical services is limited.

This is particularly true in developing nations, where renal replacement centers are primarily located in large cities and towns.[9,10]

**Techniques for acute PD**

Tidal peritoneal dialysis (TPD), continuous flow peritoneal dialysis (CFPD), continuous equilibration peritoneal dialysis (CEPD), and acute intermittent peritoneal dialysis (AIPD) are the five forms of acute PD (HVPD). These various approaches are applied according to the patient's needs and the facility's preferences. The urea clearance is 8 mL/min–12 mL/min for AIPD, 15 mL/min for TPD, and 30 mL/min–35 mL/min for CFPD.[11,12]

**PD in neonate and pediatric AKI**

AKI is linked to increased mortality and affects 3%–5% of patients in pediatric and neonatal intensive care units. PD should be the recommended course of therapy for newborns and juvenile AKI. Peritoneal

dialysis is commonly indicated for hemolytic uremic syndrome, septicemia, and acute kidney injury caused by acute diarrheal illness. The fact that a newborn's peritoneal surface area is double than that of an adult is advantageous. The dosage of PD should be adjusted based on the patient's needs.[13,14]

**Peritoneal dialysis in chronic kidney disease**

Due to its improved survival rates in the first two years, more patients are likely to benefit from using PD as their "initial" RRT modality. The flexibility of scheduling, the ability to avoid required hospital visits, which saves time, and the ease of performing dialysis at home are strong justifications for initiating PD.[15]

PD patients face no restrictions on their ability to travel, obtain jobs, or participate in social activities. Advances in technique have contributed to a decrease in PD-related infections while increasing infections among HD patients. Consequently, HD patients face a higher risk of septicemia, hospitalization, and death. PD is the recommended modality for potential transplant recipients, as patients who have previously undergone PD are more likely to experience a quicker decline in plasma creatinine, a lower risk of delayed graft function, and a reduced risk of mortality or failing the graft.

With the native kidneys contributing to enhanced middle molecular clearance, fluid status, cardiac function, nutrition, hemoglobin levels, bone-mineral metabolism, and quality of life, PD typically allows for the initial preservation of residual renal function (RRF) in most patients. [16]

**Chronic PD in children**

The best treatment for children with end-stage renal disease (ESRD) is transplantation, which improves long-term survival and quality of life. When transplantation is delayed, PD is the recommended RRT modality for children, allowing them to receive therapy that is flexible enough to accommodate their needs in terms of education and lifestyle.

PD is indicated when a child weighs less than 5 kg and has challenging vascular access, or when anticoagulation is contraindicated. The lack of small dialysate bags, which limits the use of PD, is a specific challenge in the developing world. The absence of dedicated HD units forces children to be dialyzed into adult HD units, making PD a desirable alternative.[17,18]

Accordingly, this study aimed to assess the prevalence and outcomes of acute and chronic peritoneal dialysis in the Iraqi population.

## MATERIALS AND METHODS

We gathered data from every patient who received acute and chronic peritoneal dialysis in Iraq from 2016 to 2024 to determine prevalence and mortality rates. Four hundred fifty patients with end-stage renal disease underwent chronic peritoneal dialysis at the Al-Najaf center.

About 950, 459, 74, and 23 patients received acute peritoneal dialysis at the Children Welfare Teaching Hospital, Mosul, Al-Nasyrea, and Al-Basra centers, respectively. All pediatric patients admitted to these centers, from the age of one day to 14 years old to determine the mortality rate in acute pediatric peritoneal dialysis in Iraqi PD centers.

**Statistical analysis**

The Statistical Package for Social Sciences (SPSS) for Windows version 10 was used for all statistical analyses. P-values less than 0.05 were considered statistically significant, and descriptive analysis was employed for demographic data and cross-tabulation to identify relationships between various variables.

## RESULTS

Among the subjects, 450 patients underwent chronic dialysis at the Al-Najaf center, with a mortality rate of 41%. Sepsis and cardiac disease were the most common causes of death. Four percent underwent kidney transplant, and 18% were transferred to hemodialysis. (Table 1,2)

Table 1 shows the outcome of CAPD in patients with ESRD in Al-Najaf. Table 2 Show the causes of death in CAPD patients in Al-Najaf. Regarding acute pediatric PD, a high rate of complete recovery was observed at the Children Welfare Teaching Hospital reaching about 72.6%. (Table 3)

**Table 1:** Outcome of CAPD in patients with ESRD in Al-Najaf

| CAPD | No. | Percentage % | p. value |
|---|---|---|---|
| Died | 211 | 41 | P=0.0654 |
| Transplantation | 20 | 4 | |
| Hemodialysis | 89 | 18 | |
| On CAPD | 190 | 37 | |
| total | 450 | 100 | |

| **Table 2:** Causes of death in CAPD patients in Al-Najaf | | | |
|---|---|---|---|
| CAPD | No. | Percentage % | p. value |
| Sepsis | 52 | 25 | P=0.0051 |
| Heart failure | 66 | 31 | |
| Stroke | 35 | 17 | |
| Pulmonary embolism | 22 | 10 | |
| Covid 19 | 36 | 17 | |
| total | 211 | 100 | |

| **Table 3**: IPD outcomes in Children Welfare Teaching Hospital/Baghdad (2016-2023) | | | |
|---|---|---|---|
| Acute PD patients | No. | Percentage % | p. value |
| Complete recovery | 690 | 72.6 | P=0.2325 |
| Died | 150 | 15.7 | |
| Acute on chronic | 110 | 11.7 | |
| total | 950 | 100 | |

The Mosul, Al-Nasyrea, and Al-Basra centres showed high rates of full recovery in relation to acute paediatric PD, with rates of 83%, 70%, and 48%, respectively as shown in tables (4,5,6).

| **Table 4:** IPD patients in Mosul centers. | | | |
|---|---|---|---|
| Patients | No. | Percentage | p- value |
| Dead | 77 | 16.7 | 0.3732 |
| Complete recovery | 382 | 83.22 | |
| Total | 459 | 100 | |

| **Table 5**: IPD pediatric patients in Al-Nasyrea. | | | |
|---|---|---|---|
| Patients | No. | Percentage | p-value |
| Dead | 22 | 29.7 | 0.232035 |
| Complete recovery | 53 | 70.2 | |
| Total | 74 | 100 | |

| **Table 6**: IPD pediatric patients in AL-Basra centers | | | |
|---|---|---|---|
| Patients | No. | Percentage | P Value |
| Dead | 6 | 26 | 0.0454 |
| Complete recovery | 11 | 48 | |
| Acute on chronic | 6 | 26 | |
| Total | 23 | 100 | |

## DISCUSSION

In our study, chronic peritoneal dialysis was performed on 450 patients in AL-Najaf City.

With mortality rate of 41%. The most common causes of death were sepsis and cardiovascular diseases, affecting half of our patients. In contrast, Ataş[19] and Najafi[20] reported a mortality rate of 25%, with cardiovascular disease being the leading cause of death in over 50% of their patients.

Only four percent of our patients underwent transplantation, compared to 12.8% reported by Ataş.[19]

Twenty-seven percent of patients were transferred to hemodialysis, while more than half of those transfers were due to peritonitis, as indicated by Ataş.[19] In our study, only 18% were transferred to hemodialysis, also due to peritonitis. About 36% of patients remained on CAPD, consistent with our results.

Regarding acute peritoneal dialysis at the Children Welfare Teaching Hospital, Al-Nasyrea, and Mosul centers, complete recovery rates were 72%, 70%, and 83 respectively. These results are similar to those found in a study conducted by Azat.[21]

Similarly, Alao[22] found that 42.9% of patients experienced full recovery of renal function, while 57.1% progressed to chronic kidney disease. These results are comparable to our data from the Al-Basra center, where approximately 48% of patients achieved complete recovery.

The lowest mortality rate in IPD was reported by Al-Saedi,[23] who showed that the mortality rate of only 15% among their patients. In the current study, the mortality rate was slightly higher in the Children Welfare Teaching Hospital and Mosul centers, while the rates in Al-Nasyrea and Al-Basra centers were 29% and 26%, respectively, aligning with the data from Abdullah[24] who presented in their study a mortality rate of 32%.

## CONCLUSIONS

Therapy for end-stage renal failure and acute kidney injury can be achieved through various renal replacement therapy (RRT) options. In industrialized countries, hemodialysis is the most common type of RRT, while peritoneal dialysis (PD) is becoming increasingly prevalent in underdeveloped countries.

Infection and cardiovascular disease are the most common cause of death in adult patients with CAPD. A high recovery rate can be obtained from acute peritoneal dialysis in children. Lack of access to CAPD solution made the practice not easy.

**Recommendations**

Benefits of peritoneal dialysis include reduced costs, home-based therapy, single access, a decreased need for highly skilled workers and large infrastructure.

1. Maintenance and sustainability of fluids for PD service, along with training for a dedicated team, should be highly recommended.
2. Encourage infection control in CAPD patient
3. More data and studies on acute peritoneal dialysis in the pediatric age group are needed.

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