



## Original Research Article

# CLINICAL OUTCOMES OF END-STAGE RENAL DISEASE PATIENTS RECEIVING ACUTE INTERMITTENT PERITONEAL DIALYSIS: AN OBSERVATIONAL STUDY

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Received : 07/01/2026  
Received in revised form : 20/02/2026  
Accepted : 11/03/2026

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DOI: 10.70034/ijmedph.2026.2.240

Source of Support: Nil,  
Conflict of Interest: None declared

**Int J Med Pub Health**  
2026; 16 (2); 1440-1443

**ABSTRACT**

**Background:** End-stage renal disease (ESRD) often presents late in low- and middle-income countries, necessitating urgent renal replacement therapy (RRT). Acute intermittent peritoneal dialysis (AIPD) remains an underutilized yet practical option, particularly in resource-limited and crisis settings. **Objectives:** To evaluate the clinical profile, biochemical changes, complications, and outcomes of ESRD patients receiving AIPD.

**Materials and Methods:** This observational study conducted in the medical ICU in a tertiary care hospital for a period of six months. Sixty adult ESRD patients undergoing AIPD were included. Demographic details, risk factors, indications for dialysis, number of cycles, complications, and outcomes were recorded. Biochemical parameters before and after AIPD were compared using paired statistical analysis.

**Results:** The study population comprised predominantly males (63.3%) with a mean age concentrated between 46–55 years. Diabetes mellitus and systemic hypertension were the major etiological factors. Refractory edema and uremic encephalopathy were the most common indications for AIPD. Significant reductions were observed in blood urea, serum creatinine, potassium, phosphorus, uric acid, and correction of metabolic acidosis ( $p < 0.01$ ). Complications were minimal, with outflow failure being the most frequent (8.3%). Overall survival was 73.3%, with 3.3% requiring conversion to hemodialysis.

**Conclusion:** AIPD is a safe, effective, and feasible modality for urgent RRT in ESRD patients, offering good biochemical clearance with acceptable outcomes.

**Keywords:** End-stage renal disease; Acute intermittent peritoneal dialysis; Renal replacement therapy; Biochemical parameters; Outcomes.

**INTRODUCTION**

Chronic kidney disease (CKD) is a growing global public health problem, with an estimated prevalence of 8–16% worldwide and a disproportionately high burden in low- and middle-income countries.<sup>[1-3]</sup> In

India, late presentation of CKD is common due to limited awareness, inadequate screening programs, and socioeconomic barriers, resulting in many patients first presenting in end-stage renal disease (ESRD).<sup>[2,4]</sup> Such patients frequently require urgent initiation of renal replacement therapy (RRT) to manage life-threatening complications including

volume overload, electrolyte imbalance, metabolic acidosis, and uremia.<sup>[5]</sup> Hemodialysis (HD) is the most commonly used modality of RRT; however, its dependence on vascular access, specialized infrastructure, trained personnel, and continuous power supply limits its immediate availability in many emergency and resource-constrained settings.<sup>[6,7]</sup> Peritoneal dialysis (PD), particularly acute intermittent peritoneal dialysis (AIPD), offers a simple, bedside, and cost-effective alternative that can be rapidly initiated without the need for vascular access.<sup>[8,9]</sup> Despite these advantages, PD remains underutilized in India due to concerns regarding inadequate solute clearance, higher infection rates, and perceived inferior outcomes when compared to HD.<sup>[10]</sup> However, several studies have demonstrated that PD is not inferior to HD in terms of short-term survival, biochemical correction, and hemodynamic stability, particularly in critically ill and late-presenting patients.<sup>[11-13]</sup> The COVID-19 pandemic further highlighted the importance of PD when HD services were overwhelmed, reinforcing its role as a viable emergency RRT modality.<sup>[14]</sup> In this context, evaluating institutional experience with AIPD is essential to guide evidence-based clinical decision-making. This study aims to assess the clinical profile, biochemical response, complications, and outcomes of ESRD patients treated with AIPD in a tertiary care center.

## MATERIALS AND METHODS

**Study Design and Setting:** This was a hospital-based observational study conducted in the medical ICU in a tertiary care hospital for a period of six months. The study Population includes adult patients diagnosed with ESRD and initiated on acute intermittent peritoneal dialysis during hospitalization. Following are the Inclusion Criteria of Patients aged  $\geq 18$  years with ESRD undergoing AIPD and providing informed consent and the Exclusion Criteria are Patients aged  $< 18$  years, those unwilling to participate, and patients with acute-on-chronic kidney disease. A total of Sixty consecutive eligible patients were included during the study period.

## Data Collection

Detailed clinical history, demographic data, comorbidities, indications for AIPD, number of dialysis cycles, and complications were recorded. Laboratory investigations including blood urea, serum creatinine, electrolytes, uric acid, random blood sugar, and arterial blood gas analysis were performed before initiation and after completion of AIPD.

## Dialysis Protocol

AIPD was performed using standard PD solutions under strict aseptic precautions. Most patients received 36 cycles, with additional cycles administered based on clinical and biochemical response. Hypertonic solutions were used selectively.

## Statistical Analysis

Data were analyzed using descriptive statistics. Continuous variables were expressed as mean  $\pm$  standard deviation. Pre- and post-dialysis biochemical parameters were compared using paired t-tests. A p-value  $< 0.05$  was considered statistically significant.

## RESULTS

A total of 60 patients were analyzed. Males constituted 63.3% of the study population. The predominant age group was 46–55 years. Diabetes mellitus and systemic hypertension were the leading risk factors for ESRD. Only 18.3% had a prior history of hemodialysis.

Refractory edema (36.7%) and uremic encephalopathy (21.7%) were the most common indications for AIPD. The majority (81.7%) required 36 dialysis cycles. Hypertonic PD was required in 5% of patients.

Biochemical analysis demonstrated significant reductions in blood urea, serum creatinine, potassium, phosphorus, uric acid, and improvement in arterial pH and bicarbonate levels following AIPD ( $p < 0.01$ ). Changes in serum calcium and random blood sugar were not statistically significant.

Complications were infrequent; 90% of patients had no procedure-related complications. Outflow failure occurred in 8.3%, and scrotal edema in one patient.

Overall, 73.3% of patients survived and were discharged, 23.3% succumbed to illness, and 3.3% required conversion to hemodialysis.

**Table 1: Demographic characteristics of the study population (n = 60)**

Variable	Frequency	Percentage
<b>Gender</b>		
Male	38	63.3
Female	22	36.7
<b>Age group (years)</b>		
18–25	2	3.3
26–35	6	10.0
36–45	10	16.7
46–55	22	36.7
56–65	15	25.0
>65	5	8.3

**Table 2: Distribution of risk factors among ESRD patients**

Risk factor	Frequency	Percentage
Diabetes mellitus + Hypertension	28	46.7
Hypertension alone	16	26.7
Diabetes mellitus alone	7	11.7
Chronic glomerulonephritis	3	5.0
Obstructive uropathy	2	3.3
Unknown etiology	9	15.0

**Table 3: Previous history of hemodialysis**

History of HD	Frequency	Percentage
Yes	11	18.3
No	49	81.7

**Table 4: Indications for acute intermittent peritoneal dialysis**

Indication	Frequency	Percentage
Refractory edema	22	36.7
Uremic encephalopathy	13	21.7
Acute pulmonary edema	12	20.0
Uremic gastritis	6	10.0
Refractory metabolic acidosis	4	6.7
Catheter-related sepsis	3	5.0

**Table 5: Dialysis characteristics**

Parameter	Frequency	Percentage
36 PD cycles	49	81.7
46 PD cycles	11	18.3
Hypertonic PD required	3	5.0

**Table 6: Complications associated with peritoneal dialysis**

Complication	Frequency	Percentage
No complications	54	90.0
Outflow failure	5	8.3
Scrotal edema / hydrocele	1	1.7

**Table 7: Clinical outcomes of patients receiving AIPD**

Outcome	Frequency	Percentage
Survived and discharged	44	73.3
Death	14	23.3
Shifted to hemodialysis	2	3.3

**Table 8: Comparison of biochemical parameters before and after AIPD**

Parameter	Before AIPD (Mean ± SD)	After AIPD (Mean ± SD)	p-value
Blood urea (mg/dL)	168 ± 42	96 ± 30	<0.001
Serum creatinine (mg/dL)	8.4 ± 2.1	5.1 ± 1.6	<0.001
Serum potassium (mEq/L)	5.9 ± 0.7	4.4 ± 0.5	<0.001
Serum phosphorus (mg/dL)	6.8 ± 1.2	4.9 ± 0.9	<0.001
Serum uric acid (mg/dL)	8.1 ± 1.5	6.0 ± 1.1	<0.001
Arterial pH	7.21 ± 0.08	7.35 ± 0.05	<0.001
Bicarbonate (mEq/L)	14.2 ± 3.1	20.6 ± 2.8	<0.001
Serum calcium (mg/dL)	8.2 ± 0.6	8.3 ± 0.5	0.41
Random blood sugar (mg/dL)	176 ± 48	168 ± 44	0.29

## DISCUSSION

This study provides real-world evidence on the effectiveness and safety of acute intermittent peritoneal dialysis in patients presenting with ESRD requiring urgent renal replacement therapy. The observed male predominance and middle-aged presentation are consistent with previously published Indian and global data on ESRD demographics.<sup>[2,4,15]</sup> Diabetes mellitus and systemic hypertension were the leading etiological factors, reflecting the epidemiological transition toward non-communicable diseases as dominant causes of CKD in developing countries.<sup>[1,3,16]</sup> The high proportion of

dialysis-naïve patients underscores delayed health-care access and highlights the need for readily deployable RRT options such as AIPD.<sup>[6,8]</sup>

Refractory edema and uremic encephalopathy were the most common indications for dialysis initiation in this cohort, similar to findings reported by Ponce et al. and Chionh et al.<sup>[9,11]</sup> AIPD provided effective control of volume overload and rapid symptomatic improvement, supporting its utility as an emergency dialysis modality.

Significant reductions in blood urea, serum creatinine, potassium, phosphorus, and uric acid levels were observed following AIPD, demonstrating adequate solute clearance. Correction of metabolic

acidosis further confirms the physiological effectiveness of AIPD, consistent with prior comparative studies between PD and HD.<sup>[12,13,17]</sup>

The lack of significant hypocalcemia or severe hyperglycemia indicates that careful prescription and monitoring can minimize metabolic complications.

Procedure-related complications were infrequent, with outflow failure being the most common and manageable issue. Importantly, no episodes of peritonitis were observed, likely due to strict aseptic technique and short-term catheter use, findings comparable to earlier reports on urgent-start PD.<sup>[10,18]</sup>

The overall survival rate of over 70% is encouraging given the severity of illness and late presentation. Mortality in this cohort likely reflects advanced disease, comorbid conditions, and sepsis rather than dialysis-related factors. Only a small proportion required conversion to hemodialysis, reinforcing the role of AIPD as an effective bridging therapy until definitive RRT planning.<sup>[7,14]</sup> Overall, these findings challenge the misconception that peritoneal dialysis is inferior to hemodialysis in acute settings. In resource-limited environments and during health-care crises, AIPD represents a valuable, life-saving modality.

## CONCLUSION

Acute intermittent peritoneal dialysis is a safe, effective, and practical option for urgent renal replacement therapy in ESRD patients. It provides adequate biochemical correction with minimal complications and favorable short-term outcomes, while offering a crucial window for planning definitive therapy.

### Limitations

The study had a relatively small sample size and short follow-up period. Causes of mortality unrelated to renal failure were not separately analyzed, and long-term outcomes were not assessed.

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