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## Peritoneal dialysis need and practice

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### Abstract

**Background:** Chronic kidney disease (CKD) is a major public health concern due to its significant impact on both morbidity and mortality. Peritoneal dialysis (PD) is a widely used kidney replacement therapy (KRT), available in two primary modalities: continuous ambulatory peritoneal dialysis (CAPD) and intermittent peritoneal dialysis (IPD), each with distinct implications for patient care. This study aims to examine the practice of peritoneal dialysis across multiple centers in Iraq.

**Methodology:** A meta-analysis was conducted using data from eight studies, representing six centers in Iraq. The data were statistically analyzed to assess patient demographics and treatment modalities.

**Results:** A total of 4,208 patients were included in the study, with 2,327 (55.3%) under the age of 15 and 1,881 (44.7%) aged 15 years or older. Of the total, 2,975 patients (70.7%) were treated for acute kidney injury with IPD, while 1,233 patients (29.3%) were undergoing CAPD for CKD. The distribution of patients across centers showed that 31.8% were from Al-Najaf, followed by Welfare Hospital (24%) and Mosul (22.8%). Patients under 15 years old with acute kidney injury were significantly more likely to receive IPD compared to those aged 15 and older (74.8% vs. 25.2%,  $p$ -value = 0.0001). All patients on CAPD (1,233, 100%) were from Al-Najaf. Welfare Hospital and Mosul accounted for the majority of IPD cases, with 33.9% and 32.3% of patients, respectively, showing a significant association ( $p$ -value = 0.0001).

**Conclusion:** Peritoneal dialysis plays a crucial role as a kidney replacement therapy, particularly in acute settings. However, greater attention and expansion of CAPD services are needed in Iraq.

**Keywords:** Chronic kidney disease, peritoneal dialysis, Iraq

### Introduction

Chronic kidney disease (CKD) is a growing global health issue, with the number of affected individuals increasing each year <sup>[1]</sup>. CKD impacts approximately 10–13% of the general population <sup>[2-4]</sup>. Over the past three decades, the prevalence of CKD has doubled, making it one of the leading causes of morbidity and mortality worldwide. CKD is now the fifth fastest-growing cause of death globally <sup>[5, 6]</sup>, resulting in 1.2 million deaths in 2019 and 2.4 million in 2020 <sup>[7-9]</sup>. Several other chronic conditions, such as diabetes, hypertension, and obesity, can contribute to the development of CKD. In the advanced stages of CKD, known as end-stage renal disease (ESRD), the kidneys lose their ability to filter the blood, leading to the accumulation of metabolic waste products in the body <sup>[10]</sup>. This can result in severe complications such as uremia and bilirubinemia, which may cause coma or even death. Dialysis is the primary treatment for removing these waste products in CKD patients <sup>[11]</sup>. In Iraq, CKD ranks among the top five most life-threatening diseases. According to data from the Iraqi Ministry of Health, approximately 6,879 patients died from renal failure in 2015. Female patients had a slightly higher mortality rate (6.9 per 3,163) compared to males (6.1 per 3,716) <sup>[12]</sup>. Peritoneal dialysis (PD) is an important kidney replacement therapy with several advantages over in-center hemodialysis (HD), including gentler volume removal, the convenience of home-based care, avoidance of vascular access, and longer preservation of residual kidney function. Additionally, PD enhances patient autonomy and involvement in their care, which can lead to improved quality of life <sup>[13-16]</sup>. Despite these benefits, PD presents certain challenges, such as the risk of peritonitis—a serious infection of the peritoneal cavity—and mechanical complications related to catheter use <sup>[17]</sup>. Research has shown that peritonitis in continuous ambulatory peritoneal dialysis (CAPD) patients often results from improper catheter care or malnutrition <sup>[18-21]</sup>.

To minimize these risks, proper education and adherence to sterile techniques are essential [22]. PD utilizes the peritoneal membrane as a natural filter, allowing waste products and excess fluids to diffuse from the blood into a dialysis solution infused into the peritoneal cavity [23]. Comparative studies between PD and HD have produced varied outcomes, largely depending on patient demographics and comorbid conditions [24, 25]. For example, PD has been shown to provide better survival rates in the early years of treatment, particularly for younger, non-diabetic patients [26]. However, this advantage tends to diminish over time, emphasizing the need for continuous patient monitoring and individualized treatment plans [27]. Recent innovations in PD catheter design and insertion techniques have contributed to improved treatment outcomes. Techniques like laparoscopic catheter insertion have been associated with lower complication rates and better catheter survival [28]. The choice of insertion method plays a crucial role in determining the success and long-term viability of PD treatment [29]. Aim of the Study: The study aims to explore peritoneal dialysis practices across multiple centers in Iraq.

**Method**

This meta-analysis incorporated data from eight studies conducted at six different centers in Iraq, spanning from 2011 to 2024. The included studies focused on both intermittent peritoneal dialysis (IPD) and continuous ambulatory peritoneal dialysis (CAPD), covering a range of patient populations including children and adults. The studies examined outcomes and complications of peritoneal dialysis (PD) in various settings, such as Najaf, Baghdad, and Welfare Teaching Hospital. They included retrospective and prospective analyses of patients receiving IPD for acute kidney injury and CAPD for chronic kidney disease (CKD). Age groups varied from children to adults, with some studies focusing specifically on children with acute renal failure and others on adults with CKD. Data were extracted from each study, including patient demographics, type of dialysis (CAPD or IPD), complications, and outcomes. A statistical analysis was performed to identify trends and patterns in the data, comparing the results across different centers and patient populations. Specific parameters such as age distribution, dialysis modality, and complication rates

were analyzed using appropriate statistical tools. The analysis also included a comparison of outcomes based on the type of dialysis, with particular attention given to differences between CAPD and IPD, patient survival rates, and complication frequencies. Centers involved in the studies included Najaf, Baghdad, Ibn Al-Balady Hospital, Welfare Teaching Hospital, and multiple other centers, providing a comprehensive view of PD practices across Iraq. Results were synthesized to evaluate the effectiveness, complications, and challenges associated with PD in Iraq, and to highlight areas for potential improvement in patient care.

**Results**

In the current study, data from 8 studies conducted at different centres in Iraq were analysed. A total of 4208 patients were included, of whom 2327 (55.3%) were under 15 years old and the remaining 1881 (44.7%) were 15 years and above (Table 1 and Figure 1).

**Table 1:** Age group distribution of the patients

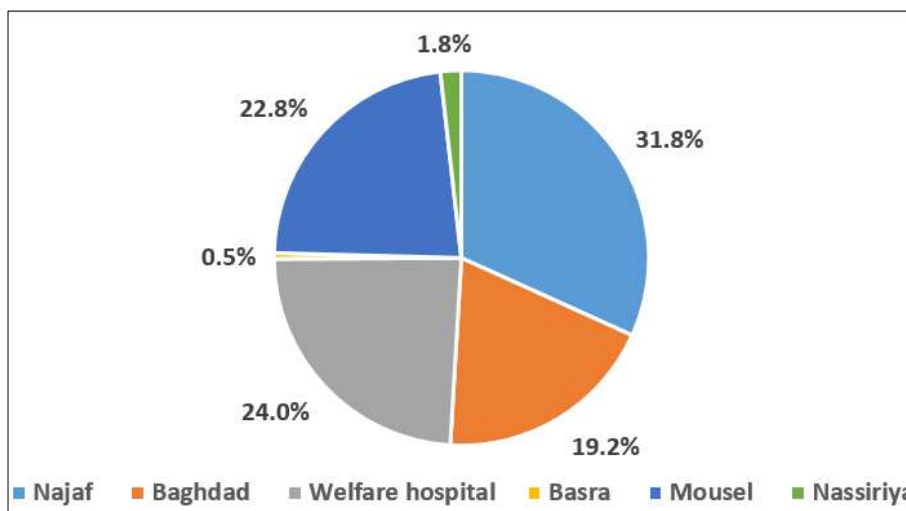
Age group	No.	%
<15 years	2327	55.3%
≥15 years	1881	44.7%
Total	4208	100%

Regarding patients' distribution according to the type of dialysis, 2975 patients (70.7%) presented with acute kidney injury and were treated with IPD, while the remaining 1233 (29.3%) presented with chronic kidney injury and were on CAPD. Table 2.

**Table 2:** Distribution of the patients according to type od dialysis

Type of dialysis	No.	%
IPD	2975	70.7%
CAPD	1233	29.3%
Total	4208	100%

Figure 3 illustrate the proportion of patients according to the centers, where, Al Najaf center received about one-third of all patients (31.8%), followed by Welfare hospital and Mousel (24% and 22.8%, respectively).



**Fig 3:** Distribution of the patients according to the centres

Table 3 show a significant association between the age of patients and type of dialysis, Children (under 15 years old) with acute kidney injury were much more likely to receive IPD treatment compared to adults (15 years old and above) (74.8% vs. 25.2%,  $P = 0.0001$ ).

**Table 3:** Association between age of the patients and type of the dialysis

		Dialysis		Total	P value
		IPD	CAPD		
Age group	<15	2206(74.2%)	121(9.8%)	2327(55.3%)	0.00001
	≥15	769 (25.8%)	1112(90.2%)	1881(44.7%)	
Total		2975 (100%)	1233(100%)	4208(100%)	

Table 4 show that all CAPD were done at AlNajaf center (100%) while welfare hospital and Mousel center account for about two-thirds of the total IPD (33.9% and 32.3%, respectively) with a significant P value of 0.00001.

**Table 4:** Distribution of the patients according to type of the dialysis and centres

	Dialysis		Total	P value
	IPD	CAPD		
Najaf	100(3.4%)	1233(100%)	1333(31.8%)	0.00001
Baghdad	810 (27.2%)	0(0%)	810(19.2%)	
Welfare hospital	1009(33.9%)	0(0%)	1009(24%)	
Mousel	959(32.2%)	0(0%)	959(22.8%)	
Nassiriyia	74(2.5%)	0(0%)	74(1.8%)	
Basra	23(0.8%)	0(0%)	23(0.5%)	
Total	2975 (100%)	1233(100%)	4208(100%)	

Regarding age groups, AlNajaf centre alone received 64.4% of the adult patients. Conversely, Welfare hospital and Mousel centre received 84.6% of patients under 15 years old,  $P = 0.00001$ . Table 5.

**Table 5:** Distribution of the patients according to the age groups and centres

	Dialysis		Total	P value
	<15	≥ 15		
Najaf	121(5.2%)	1212(64.4%)	1333(31.8%)	0.00001
Baghdad	141(6.1%)	669(35.6%)	810(19.2%)	
Welfare hospital	1009(43.4%)	0(0%)	1009(24%)	
Mousel	959(41.2%)	0(0%)	959(22.8%)	
Nassiriyia	74(3.2%)	0(0%)	74(1.8%)	
Basra	23(0.9%)	0(0%)	23(0.5%)	
Total	2327(100%)	1881(100%)	4208(100%)	

## Discussion

Peritoneal dialysis (PD) accounts for approximately 9% of all kidney replacement therapy (KRT) worldwide and 11% of all dialysis treatments, with the majority of patients receiving PD residing in four countries: China, the USA, Mexico, and Thailand [30, 31]. This meta-analysis provides valuable epidemiological insights into PD practice across multiple centers in Iraq, revealing key trends and highlighting the continued importance of PD, particularly among pediatric populations. In this analysis, a total of 4,208 patients from eight studies were included, with 55.3% (2,327 patients) being under 15 years of age. This underscores the significant role of PD as a KRT modality for pediatric patients, especially given that 1,009 patients (24% of the total) were from the Children Welfare Teaching Hospital. The data clearly indicate that PD remains a dominant choice for kidney replacement therapy in pediatric

patients, reflecting both its efficacy and accessibility for younger populations. The results show that the majority of patients (70.7%, 2,975 patients) underwent intermittent peritoneal dialysis (IPD), which is likely due to the acute presentation of kidney disease in many patients, particularly children. Among the 2,327 patients under 15 years old, 2,206 (74.2%) received IPD, while only 121 (9.8%) were treated with continuous ambulatory peritoneal dialysis (CAPD). In contrast, among patients aged 15 years and older, CAPD was the main modality, representing 1,112 patients (90.2%). This reflects the practice of more hemodialysis in older age groups, where CAPD is typically reserved for patients with end-stage kidney disease (ESKD). Although CAPD accounted for only 29.3% (1,233 patients) of the total PD cases, there has been a recent shift toward increasing CAPD utilization, driven by support from the Iraqi Ministry of Health. Notably, all 1,233 CAPD patients in this analysis were from a single center in Al-Najaf, while only 100 patients (3.4% of all IPD patients) from the same center received IPD. This suggests that CAPD is currently concentrated in certain centers, with Al-Najaf leading the way in CAPD adoption. The distribution of IPD patients across centers was more widespread, with a significant proportion (33.9%, 1,009 patients) being treated at the Children Welfare Teaching Hospital. This highlights the fact that IPD is primarily used for pediatric patients, who often present acutely and benefit from the gentler volume removal provided by IPD.

## Conclusion

This meta-analysis underscores the crucial role of peritoneal dialysis, particularly IPD, in the acute management of kidney disease in pediatric patients across Iraq. However, there is a clear need for greater attention to CAPD, especially for patients with ESKD. Expanding CAPD practices, as seen in Al-Najaf, could significantly improve treatment outcomes and patient quality of life, particularly as CAPD offers several advantages, including home-based care and the preservation of residual kidney function. Increased support and adaptation of CAPD practices in other centers across Iraq could further enhance the overall care for CKD patients.

## Conflict of Interest

Not available

## Financial Support

Not available

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