

Peritonitis Rate in Patients Undergoing Automated Peritoneal Dialysis Muhammad Anees¹, Irfan Munir², Noman Butt¹, Irfan Elahi¹, Hina Akbar¹, Muhammad Shehbaz Pervaiz¹

Department of Nephrology, Mayo Hospital King Edward Medical University, Lahore¹
Indiana University School of Medicine, Indiana, USA²

Abstract

Introduction: Peritonitis is a serious complication causing significant morbidity and mortality nevertheless can be prevented in most cases with careful infection control precautions. The objective of this study was to determine the rate of peritonitis in patients undergoing automated peritoneal dialysis (APD).

Study Design: Descriptive retrospective study

Place and Duration of Study: Department of Nephrology, Mayo Hospital Lahore, from February 2023 to February 2024.

Methods: Twelve patients started on automated peritoneal dialysis Byonyks cyclor and were evaluated for peritonitis over one year. Patients who had suffered peritonitis were followed up in OPD. Peritonitis episodes were documented and evaluated by sending dialysis effluent fluid in blood culture bottles for organism identification and sample for total leukocyte count as per ISPD guidelines. Each episode of peritonitis was managed as per ISPD guidelines.

Results: The mean age of patients was 42.3 ± 13 . Years and 50% were males. 49.9% were diabetics and 25% hypertensive. 4 episodes of peritonitis were observed in 3 patients, and not a single episode of exit site infection was observed. Calculated rate of peritonitis was 0.76 episode per patient year.

Outcome: All peritonitis episodes resolved with antibiotics and no catheter removal was reported.

Conclusion: This is the first report of peritonitis from Pakistan among patients undergoing APD. Only 4 episodes of peritonitis were observed that were easily managed with no consequences.

Considering a new APD program the peritonitis rates were not significantly high and improvement in peritonitis rate is expected with gain of clinical experience in the future.

Key words: Peritoneal dialysis, peritonitis, end stage kidney disease, exit site infection, Pakistan.

Corresponding Author

Dr. Muhammad Anees

Department of Nephrology, Mayo Hospital Lahore

Email: dranees109@hotmail.com

DOI: [10.53778/pjkd84283](https://doi.org/10.53778/pjkd84283)

Received 16 Dec, 2024 & Accepted 28 Dec, 2024

PJKD 2024;8(4):18-22

Introduction

Peritonitis is one of the most dreadful and most feared complication in patients undergoing peritoneal dialysis with significant morbidity and mortality.^{1,2} This serious complication often leads these patients to discontinue peritoneal dialysis and initiation of hemodialysis.³ Certain factors favoring peritonitis include touch contamination, poor technique of performance, systemic diseases like diabetes making such patients more prone towards infections, migration of pathogen in case of infected gut, malnutrition and decreased immunity in patients of chronic kidney disease, increasing weight, old age, hypoalbuminemia and peritoneal dialysis catheter exit site infections.² Exit site infection has striking association with subsequent peritonitis in up to 60 days.⁴

PD Peritonitis

International Society of Peritoneal Dialysis (ISPD) which defines peritonitis if any of the two are fulfilled: 1) a total leukocyte count $>100/\mu\text{L}$ or $0.1 \times 10^9/\text{L}$ in dialysis effluent after at least 2 hours' dwell time with neutrophils $> 50\%$; 2) positive culture of dialysis effluent; 3) clinical features of abdominal pain and/ or dialysis effluent with cloudy appearance.⁵

Recommended target for overall peritonitis rate should not exceed 0.4 episode/ year.⁵ Overall rate of peritoneal dialysis associated peritonitis has declined to 0.303 episodes/ patient year in 2019 from 0.6 episodes/ patient year in 1992.⁶ Prior multicenter published rates of peritonitis across the globe showed 0.26 to 0.29/ patient year in Canada, the United States of America and Japan and higher in the United Kingdom, Australia/ New Zealand and Thailand i.e. 0.35 – 0.40/ patient year.⁷

The importance of treating peritonitis earliest possible is again another sensitive issue. Delaying the treatment every increasing hour from hospital admission to antimicrobial therapy administration increases the risk of failure of peritoneal dialysis or death by 6.8%.⁸

Automated peritoneal dialysis (APD) is a new modality in Pakistan and this is the first study conducted in Pakistan to the best of author's knowledge as no prior study on this subject exists, even for patients on CAPD. The objective to conduct this study was to determine rate of peritonitis in patients undergoing APD in Pakistan. Conclusion of this study may help in future for reference and improving outcomes.

Methods

This descriptive retrospective study was conducted in Department of Nephrology, Mayo Hospital from February 2023 to February 2024. 12 patients were enrolled in APD peritoneal dialysis program utilizing Byonyks cyclor (Byonyks Pvt Ltd, Lahore, Pakistan) and evaluated for peritonitis over one year. Patients demographic data including name, age, gender, residence was taken from hospital peritoneal dialysis enrollment record. Peritoneal dialysis catheters were passed using fluoroscopy guidance and laproscopic approach as decided by the surgeon. Patients who had suffered peritonitis were followed up in OPD every three months. The diagnostic criteria for peritonitis were consistent with ISPD guidelines including clinical manifestations, organism identification with culture and total leukocyte count of dialysis effluent fluid^[5].

Peritonitis episodes were documented as per ISPD guidelines detailed above, and dialysis effluent was evaluated for total leukocyte count and organism identification by sending fluid in blood culture bottles as per ISPD guidelines^[5]. The samples were sent for culture along with the cell count at the first indication of possibility of peritonitis.

After identification each episode of peritonitis was managed as per ISPD guidelines and peritonitis rate was calculated by dividing the number of peritonitis episodes by total number of patient years.⁵ The statistical analysis of collected data was done by using SPSS version 29 and the results were analyzed by calculating frequencies and percentages.

PD Peritonitis

Results

The mean age of patients was 42.3 ± 13 years and 50% were males. 49.9% were diabetics and 25% hypertensive. A total of 435 independent APD therapies were performed over 1438 patient days or 3.93 total number of patient years.

Four episodes of peritonitis were observed in three patients, and not a single episode of exit site infection was observed, Figure 1. Patient with two peritonitis episodes had one episode due to touch contamination, the other was due to disposable set leakage.

One patient developed peritonitis due to diarrhea and *E. coli* was reported in the culture report. One patient developed peritonitis because therapy was performed by attendant not yet trained for PD. Calculated rate of peritonitis was 0.76 episode per patient year.

Outcome: All peritonitis episodes resolved with conservative management using intra peritoneal antibiotics. Moreover, no serious consequences were observed including catheter removal or termination of peritoneal dialysis therapy and transfer to hemodialysis.

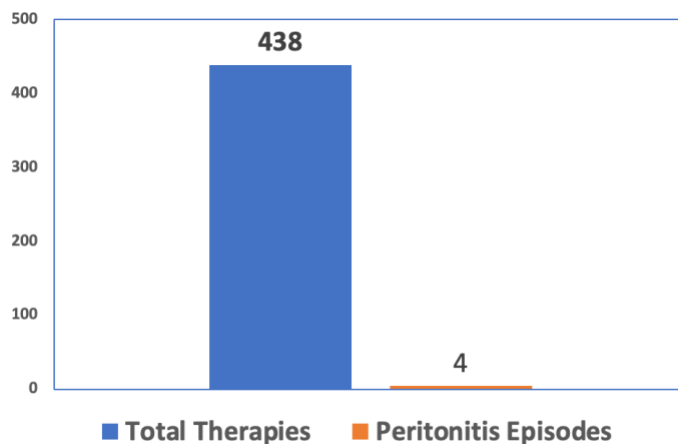


Figure1: Total number of APD therapies over a year among 12 patients and the total number of episodes of peritonitis observed.

Discussion

In Pakistan Peritoneal dialysis utilization ratio is less than 1% which is remarkably low. Since 2020 there were only approximately 76 patients on continuous ambulatory peritoneal dialysis (CAPD) and none were on APD^[9]. APD was initiated in Pakistan in 2021 and our center is the largest center for APD in Pakistan.

In this study the rate of peritonitis is 0.76/ patient year which is higher than the recommended cut off target set by ISPD guidelines i.e. 0.4 episode/ year. The higher rate of peritonitis may confer to the fact that 49.9% were diabetics and 3 out of 4 episodes were somehow related to techniques including incomplete training, disposable set leakage and touch contamination. This is in contrast to the previous

PD Peritonitis

study which assessed the factors associated with the time to first peritonitis episode in peritoneal dialysis and found older age, more number of peritoneal dialysis bags connected in 24 hours, hypoalbuminemia and high body weight ^[10]. This points to the fact that this newly initiated automated peritoneal dialysis program still needs keen consolidation of training of the patient and the care taker at home. Unfortunately, no study exists about peritonitis rates in Pakistan even for CAPD and we are not sure about the comparison with peritonitis rates of CAPD vs APD. However, not a single episode of exit site infection was reported which is a success.

This study has some limitations. First, the sample size of this current study was small. Second, it needs more insight into the other factors of causing peritonitis e.g. relation of co-morbid conditions like diabetes in peritonitis, the level of education in conducting training, the residential conditions of the patients. More studies are therefore required to further evaluate the local existing factors that need to be considered in training and managing patients on peritoneal dialysis in Pakistan.

Conclusion

This is the first report of peritonitis from Pakistan among patients undergoing APD. Only 4 episodes of peritonitis were observed that were easily managed with no consequences.

Current report is encouraging as no exit site infections were observed and peritonitis rates suggest that more vigorous training and collaboration among different centers utilizing this newer modality in Pakistan to gain clinical experience for better patient care.

Conflict of Interest: None Declared

This study was presented as a poster at International Society of Peritoneal Dialysis ISPD2024 conference at Dubai, UAE, Abstract #148, 26-29 Sep, 2024.

References

1. Chung MC, Yu TM, Wu MJ, Chuang YW, Muo CH, Chen CH, Huang ST, Li CY, Shieh JJ, Hung PH, Chung CJ. Impact of peritoneal dialysis-related peritonitis on PD discontinuation and mortality: A population-based national cohort study. *Perit Dial Int.* 2022 Mar;42(2): 194-203. doi:10.1177/08968608211018949.
2. Alwakeel JS, Alsuwaida A, Askar A, Memon N, Usama S, Alghonaim M, Feraz NA, Shah IH, Wilson H. Outcome and complications in peritoneal dialysis patients: a five-year single center experience. *Saudi J Kidney Dis Transpl.* 2011 Mar;22(2):245-251.
3. Béchade C, Guittet L, Evans D, Verger C, Ryckelynck JP, Lobbedez T. Early failure in patients starting peritoneal dialysis: a competing risks approach. *Nephrol Dial Transplant.* 2014 Nov;29(11):2127-35. doi:10.1093/ndt/gft055.
4. van Diepen AT, Tomlinson GA, Jassal SV. The association between exit site infection and subsequent peritonitis among peritoneal dialysis patients. *Clin J Am Soc Nephrol.* 2012 Aug;7(8):1266-71. doi:10.2215/CJN.00980112.
5. Li PK, Chow KM, Cho Y, Fan S, Figueiredo AE, Harris T, Kanjanabuch T, Kim YL, Madero M, Malyszko J, Mehotra R, Okpechi IG, Perl J, Piraino B, Runnegar N, Teitelbaum I, Wong JK, Yu X, Johnson DW. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. *Perit Dial Int.* 2022 Mar;42(2):110-153. doi:10.1177/0896860822108058.
6. Marshall MR. A systemic review of peritoneal dialysis-related peritonitis rates over time from national or regional population-based registries and databases. *Perit Dial Int.* 2022 Jan;42(1): 39-47. doi:10.1177/0896860821996096.
7. Perl J, Fuller DS, Bieber BA, Boudville N, Kanjanabuch T, Ito Y, Nessim SJ, Piraino BM, Schaubel DE, Schreiber MJ, Teitelbaum I, Woodrow G, Zhao J, Jhonson DW. Peritoneal Dialysis-Related Infection Rates and Outcomes:

- Results From the Peritoneal Dialysis Outcomes and Practice Patterns Study (PDOPPS). *Am J Kidney Dis.* 2020 Jul;76(1):42-53. doi: 10.1053/j.ajkd.2019.09.016.
8. Muthucumarana K, Howson P, Crawford D, Burrows S, Swaminathan R, Irish A. The Relationship Between Presentation and the Time of Initial Administration of Antibiotics With Outcomes of Peritonitis in Peritoneal Dialysis Patients: The PROMPT Study. *Kidney Int Rep.* 2016 Jun 11;1(2):65-72. doi: 10.1016/j.ekir.2016.05.003.
 9. Qayyum A. Opinion: Peritoneal Dialysis in Pakistan: An Insider's View. *State of Affairs and Planning?*. *Pak J Kidney Dis.* 2021 May 7;4(1):6-10. doi: 10.53778/pjkd42155
 10. Ljungman S, Jensen JE, Paulsen D, Petersons A, Ots-Rosenberg M, Saha H, Struijk D, Wilkie M, Heimbürger O, Stegmayr B, Elung-Jensen T, Johansson AC, Rydström M, Gudmundsdottir H, Hussain-Alkhateeb L; Peritonitis Prevention Study (PEPS) Trial Investigators. Factors associated with time to first dialysis-associated peritonitis episode: Data from the Peritonitis Prevention Study (PEPS). *Perit Dial Int.* 2023 May;43(3):241-251. doi: 10.1177/08968608231161179.