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Review article

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# Mortality risk factors in patients who developed peritonitis in chronic peritoneal dialysis at the Central Military Hospital of Bogotá

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**Abstract**

In Colombia, chronic peritoneal dialysis (CPD) is one of the most common forms of onset of chronic renal replacement therapy. Complications associated with therapy are low. However, the peritonitis associated with CKD has been related to change from therapeutic mode to chronic hemodialysis with increased hospitalization rates. A case-control study was performed to evaluate the mortality and risk factors associated in patients who presented peritonitis in CPS in the period from January 1st of 2010 to December 31st of 2012. The risk factors identified for the development of peritonitis and mortality were not statistically significant. The cases of peritonitis attributed to fatigue of the caregiver presented an increased risk of recurrence and relapse. In regard to the risk of mortality it was found to be 1.75 times greater in men, 1.6 times higher in males, 2.2 times greater in patients older than 75 years, 3.5 times higher in diabetic patients and 5.6 times higher in hypertensive patients.

**Key words:** Chronic peritoneal dialysis, peritonitis, mortality

## Factores de riesgo de mortalidad en pacientes que presentaron peritonitis en diálisis peritoneal crónica en el Hospital Militar Central de Bogotá

**Resumen**

La diálisis peritoneal crónica (DPC) es una de las opciones más frecuentes de inicio de terapia de remplazo renal crónico en Colombia. La presencia de complicaciones inherentes a la terapia tiene baja incidencia, sin embargo, la peritonitis asociada con DPC se ha relacionado con el posterior cambio de modalidad terapéutica a hemodiálisis crónica y con aumento de las tasas de hospitalización. Se desarrolló un estudio de casos y controles con el fin de evaluar la mortalidad y posibles factores de riesgo asociados en los pacientes que presentaron peritonitis en DPC en el periodo comprendido entre el 1 de enero de 2010 y el 31 de diciembre de 2012.

Los factores de riesgo identificados para desarrollo de peritonitis y mortalidad no tuvieron significancia estadística.

Los casos de peritonitis atribuidos a fatiga del cuidador, presentaron mayor riesgo de recurrencia y recaída de la peritonitis. En cuanto al riesgo de mortalidad se encontró que la probabilidad para la presentación de dicho desenlace fue 1,75 veces mayor en los hombres, 2.2 veces mayor en los pacientes mayores de 75 años, 3.5 veces mayor en los diabéticos y 5.6 veces más elevado en los pacientes hipertensos.

**Palabras clave**: Diálisis peritoneal crónica, peritonitis, mortalidad.

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## Introduction

The risk factors to develop CPD associated to peritonitis have been evaluated in a number of studies [1-6] in which two scenarios are usually considered for its interpretation: risk factors that relate to the first episode of peritonitis and those related to recurrences. It is important to note that recurrent peritonitis has been associated with a higher frequency of peritoneal membrane dysfunction, which may lead to a change in treatment modality.

In a study using the USRDS database of 11,975 patients with CPD prevalence in the period between 1994 and 1997, the major risk factors identified were age under 44 years, diabetes mellitus, black race, and congestive heart failure3. In the ANZDATA registry in Australia and New Zealand, among 3,162 CPD patients treated between 1999 and 2003, obesity, Australian Aboriginal race, and advanced age were identified as risk factors for peritonitis4. In Canada, in the POET registry, among 4,247 patients with CPD between 1996 and 2005, the main risk factors identified were the transfer of chronic hemodialysis to CDP, diabetes mellitus and among diabetics, female gender.

In the BRAZPD study in Brazil, among 2,032 incident patients with CPD between 2004 and 2007, it was found that the low educational level, living in the north of the country, living at a distance greater than 50 km from the dialysis center and to belong to a dialysis center with more than 150 patients, were independent risk factors for CPD6 peritonitis.

A variety of risk factors concerning the development of peritonitis associated with CPD have been identified. However, the risk factors for mortality in this population are still unknown, especially in the population with recurrence.

## Objectives and hypotheses

To evaluate mortality risk factors in chronic dialysis patients who presented peritonitis associated with chronic peritoneal dialysis at the Nephrology Service of the Central Military Hospital of Bogotá, during the period from January 1st of 2010 to December 31st of 2012.

## Design

Observational case-control study nested in a cohort.

## Materials and methods

A retrospective case-control study was performed, where patients older than 18 years of age were admitted, with a confirmed diagnosis of chronic stage 5 renal disease according to the 2012 KDIGO guidelines and a confirmed diagnosis of peritonitis associated with chronic peritoneal dialysis, according to the Guide to Infections Associated with Peritoneal Dialysis 2010[7,8].

Patients from the CDP program of the Central Military Hospital of Bogotá Colombia, who presented peritonitis and died during the proposed follow-up period, were included in the selection of the cases. For the controls we included patients with peritonitis associated with non-deceased CDP, recording demographic, clinical or paraclinical characteristics during the follow-up period.

Descriptive statistical analysis includes, for continuous variables, the calculation of central tendency and dispersion measures such as averages and standard or median deviations for numerical variables, and absolute frequencies and percentages for categorical variables.

In addition, a bivariate analysis was carried out to identify risk factors for mortality among recruited patients. For the numerical data the mean difference between the groups was calculated using t-student (when the distribution was normal) or the difference of the mean range between the groups using the Wilcoxon test (when the distribution was not normal). For the nominal qualitative variables, the possible associations were identified by $\chi 2$ (chi-square) for categorical variables.

Finally, the OR was calculated with its respective confidence interval in those variables that showed some association. The level of statistical significance was defined as a $p < 0.05$. All statistical

analyzes were performed using the SPSS statistical package.

## Results

During the period included between January 1st of 2010 and December 31st of 2012, a total of 64 episodes of peritonitis were reported in patients with CDP. A total of 127 patients with CDP were analyzed, 62 who underwent peritonitis and 65 who did not present this complication. No statistically significant differences were found regarding the demographic and clinical characteristics between the 2 groups. In both cases, male patients (71% and 69.2%, respectively) and those over 55 (59.7% vs. 63.1%, respectively) predominated. The most frequently used dialysis modality was automated peritoneal dialysis (APD) (59.7% in males and 72.3% in adults over 55) and the most common comorbidities were diabetes mellitus (35.4%) and arterial hypertension (75.3%).

Among patients with CPD peritonitis, the most frequent clinical findings were cloudy fluid (98.4%) and abdominal pain (83.9%), followed by tachycardia (35.5%) and vomiting (32.3%) ( Figure 1).

When evaluating the characteristics of the peritoneal fluid, it was found that the white blood cell count ranged between 40 and 60940, with a mean of 6369.7 ± 11102 and a percentage of neutrophils between 64% and 100% with an average of 89.07 ± 8.93.

Regarding microbiology, 62.9% of the Gram studies were reported as negative. Among those in which a germ was identified, Gram positive cocci were the most frequent (24.2%), followed by Gram negative bacilli (8.1%) and Gram negative cocci (1.6%). Table 1 describes the microorganisms that were isolated in the cultures: in 70.9% of the cases, a germ was isolated (n = 44).

With respect to the risk factors for developing peritonitis associated with CPD, it was evidenced that the male patients had a greater probability for this outcome (OR 1.086 IC95% 0.508 - 2.324). Similarly, patients with a history of diabetes mellitus (OR 1,152 CI 95% 0.552 - 2.404), high blood pressure (OR 1.852 CI 95% 0.552 - 2.404), and glomerulonephritis (OR 2,590 95% CI 0.754 - 8.895) , or systemic lupus erythematosus (OR 1,052 95% CI 0.251-4403) or autoimmune disease (OR 1.252 95% CI 0.396-3.955) presented an increased risk for peritonitis associated with CPD.

Regarding the risk factors for recurrence, recidivism or relapse of peritonitis associated with CPD, it was evidenced that the probability of this outcome was higher among male patients (OR 1.667 95% CI 0.405 - 6.861), managed under APD mode (OR 1.994 CI 95% 0.534 - 7.079), with a history of glomerulonephritis (OR 3.44 CI 95% 0.780 - 15.172) or autoimmune disease (OR 1,433 95% CI 0.247 - 8.333), whose initial episode of peritonitis was secondary to failure of the connecting technique (OR 1.667 95% CI 0.405 - 6.861) or associated with the caregiver (OR 3 95% CI 0.873-10.312).

The risk of mortality was found to be 1.7 times higher in male patients, 2.2 in patients older than 75 years, 3.5 in diabetic patients and 5.6 times higher in patients Hypertensive.

## Discussion

Peritonitis associated with CPD is a frequent complication of patients receiving this mode of chronic dialysis. Evaluation of the peritoneal fluid consitutes a key point in the diagnosis of peritonitis, with turbidity of the peritoneal fluid being the main clinical sign. The repetitive peritoneal infectious processes lead to membrane failure and constitute a marker of quality within the programs of the renal units, taking a primary role of prevention rather than intervention after occurrence of events.

Peritonitis associated with CDP has been reported as having low mortality rate, however, it is a frequent cause of peritoneal membrane deterioration1. Peritonitis associated with CPD is the main cause for change in chronic renal replacement therapy and long-term peritoneal membrane dysfunction8. The efforts to control peritonitis in CDP are directed towards the identification of risk factors for the development of intraperitoneal infectious processes, such as the identification and management of exit orifice infections, tunnel infection and other risk factors such as diabetes, obesity and constipation[9]. Pro-

gress in catheter implantation techniques and timely withdrawal when there is no response to treatment (5 days), early relapse (S. epidermidis) or in cases of multiresistant germ infections (pseudomonas, fungi, BLES) the rate of functional losses of the peritoneum has decreased, and it has been related to a smaller change in the modality of therapy[10,11].

The present study made a close assessment of the possible factors associated with the occurrence of DPC peritonitis, finding that, factors associated with the connecting technique and the participation of the caregiver in the management of the patient in DPC ,can be related to the presentation of these infectious events, being important the monitoring and retraining of them. Likewise, we consider it important to evaluate periodically the emotional elements, adherence and commitment of those who participate in the implementation of therapy at home, in order to improve the opportunity of interventions[12-14].

Mortality in the population group on chronic peritoneal dialysis (to clarify if I have corrected it) has been reported between 10% to 20% per year, with infections being part of the conditions found. The mortality rate of peritonitis differs between the various reports in the literature, ranging between 5% and 30%[15,16]. Thus, according to Australian reports, about 20% of patients who die in CPD may have an episode of peritonitis in the previous 30 days, with a 6 times increased risk of having a recent infectious episode when comparing the period of 30 days with that of 6 months prior to death[17,18]. However, it is difficult to define the risk factors, the conditions associated with these fatal outcomes and the time at which the peritonitis episode may be related to mortality[19,20]. To date, studies that have analyzed this relationship can not be interpreted as causality evidence[18,21].

Risk factors for mortality were identified in the population with a history of CDP peritonitis (age, diabetes mellitus and hypertension), similar to those reported in the general population on chronic dialysis. Within the population studied, general mortality occurred after 30 days of diagnosis of the peritoneal infectious process, which could explain the results found. It is important to continue investigating prospective studies that may characterize the population in chronic peritoneal dialysis who are at increased risk of having a fatal outcome associated with peritonitis.

## CONCLUSIONS

The present study aimed to make a close assessment of the possible factors associated with mortality. However, we did not find statistical significance in the evaluated variables, which does not allow to generate definitive conclusions. Risk factors for mortality (age, diabetes mellitus and arterial hypertension) identified in the population with CPD peritonitis do not differ from the factors reported in the literature for patients on chronic peritoneal dialysis.

### Interest of conflict

The authors declare no conflict of interest.

Figure 1

Clinical findings of patients with chronic peritoneal dialysis peritonitis

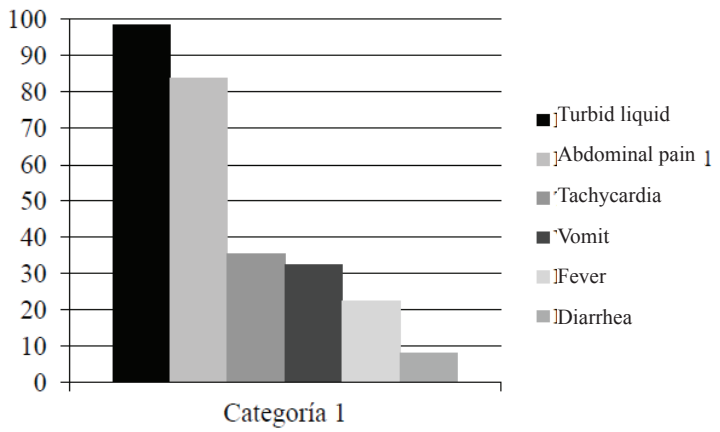


Table 1

Etiologic agent of peritonitis associated with chronic peritoneal dialysis

| Organismo | n | % |
|---|---|---|
| ***Gram positivos*** | ***26*** | ***41,9*** |
| Staphylococcus epidermis | 9 | 14,5 |
| Staphylococcus aureus | 8 | 12,9 |
| Enterococo fecalis | 3 | 4,8 |
| Streptococcus intermedius | 2 | 3,2 |
| Staphylococcus hominis | 1 | 1,6 |
| Staphylococcus warneri | 1 | 1,6 |
| Staphylococcus anginosus | 1 | 1,6 |
| ***Gram negativos*** | ***17*** | ***27,4*** |
| Klebsiella pneumoniae | 5 | 8,1 |
| Escherichia coli | 4 | 6,4 |
| Enterobacter cloacae | 2 | 3,2 |
| Streptococcus marcescens | 2 | 3,2 |
| Haemophylus spp. | 1 | 1,6 |
| Klebsiella oxytoca | 1 | 1,6 |
| Pseudomona aeruginosa | 1 | 1,6 |
| Stenotrophomona maltophilia | 1 | 1,6 |
| ***Hongos*** | ***1*** | ***1,6*** |
| Candida albicans | 1 | 1,6 |
| ***Cultivo negativo*** | ***17*** | ***27,4*** |
| ***Sin dato*** | ***1*** | ***1,6*** |

## References


1. Davenport A. Peritonitis remains the major clinical complication of peritoneal dialysis: the London, UK, peritonitis audit 2002-2003. Perit Dial Int. 2009;29(3):297-302.
2. Nieto-Ríos JF, Díaz-Betancur JS, Arbeláez-Gómez M, et al. Peritoneal dialysis-related peritonitis: twenty-seven years of experience in a Colombian medical center. Nefrología. 2014;34(1):88-95.
3. Oo TN, Roberts TL, Collins AJ: A comparison of peritonitis rates from the United States Renal Data System database: CAPD versus continuous cycling peritoneal dialysis patients. Am J Kidney Dis 2005;45:372-380.
4. Lim WH, Johnson DW, McDonald SP: Higher rate and earlier peritonitis in Aboriginal patients compared to non-Aboriginal patients with end-stage renal failure maintained on peritoneal dialysis in Australia: Analysis of ANZDATA. Nephrology (Carlton) 2005;10:192-197.
5. Nessim SJ, Bargman JM, Austin PC, et al. Predictors of peritonitis in patients on peritoneal dialysis: results of a large, prospective Canadian database. Clin J Am SocNephrol. 2009 Jul;4(7):1195-1200.
6. Martín LC, Caramori JC, Fernández N, et al. Brazilian Peritoneal Dialysis Multicenter Study BRAZPD Group. Geographic and educational factors and risk of the first peritonitis episode in Brazilian Peritoneal Dialysis study (BRAZPD) patients. Clin J Am Soc Nephrol. 2011;6(8):1944-1951.
7. Li PK, Szeto CC, Piraino B, et al. International Society for Peritoneal Dialysis. Peritoneal dialysis-related infections recommendations: 2010 update. Perit Dial Int. 2010 Jul-Aug;30(4):393-423.
8. Stevens PE, Levin A; Kidney Disease: Improving Global Outcomes Chronic Kidney Disease Guideline Development Work Group Members. Evaluation and management of chronic kidney disease: synopsis of the kidney disease: improving global outcomes 2012 clinical practice guideline. Ann Intern Med. 2013;158(11):825-830.
9. Piraino B, Bailie GR, Bernardini J, et al. Peritoneal Dialysis-Related Infections. Recommendations 2005 UPDATE. Perit Dial Int 2005;25:107-131.
10. Li PK, Law MC, Chow KM, et al. Comparison of clinical outcome and ease of handling in two double-bag systems in continuous ambulatory peritoneal dialysis: a prospective, randomized, controlled, multicenter study. Am J Kidney Dis 2002;40(2):373-380.
11. Strippoli GFM, Tong A, Johnson D, et al. Catheter-related interventions to prevent peritonitis in peritoneal dialysis: a systematic review of randomized controlled trials. J Am SocNephrol 2004;15(10):2735-2746.
12. Troidle L, Watnick S, Wuerth D, et al. Depression and its association with peritonitis in long-term peritoneal dialysis patients Am J Kidney Dis 2003;42:350-354.
13. Jager KJ, Merkus MP, Dekker FW, et al. NECOSAD Study Group: Mortality and technique failure in patients starting chronic peritoneal dialysis: Results of The Netherlands Cooperative Study on the Adequacy of Dialysis. Kidney Int 1999;55:1476-1485.
14. Johansen KL, Chertow GM, Jin C, Kutner NG: Significance of frailty among dialysis patients. J Am SocNephrol 2007;18:2960-2967.
15. Fang W, Qian J, Lin A, et al. Comparison of peritoneal dialysis practice patterns and outcomes between a Canadian and a Chinese Centre. Nephrol Dial Transplant 2008;23:4021-4028.
16. Hiramatsu M; Japanese Society for Elderly Patients on Peritoneal Dialysis: How to improve survival in geriatric peritoneal dialysis patients. Perit Dial Int 2007;27(S2):S185-S189.
17. Excell L, Livingston B, McDonald SP: ANZDATA Registry Report 2010, Adelaide, South Australia, Australia and New Zealand Dialysis and Transplant Registry, 2010.
18. Boudville N, Kemp A, Clayton P, et al. Recent peritonitis associates with mortality among patients treated with peritoneal dialysis. J Am SocNephrol 2012;23(8):1398-1405.
19. Sipahioglu MH, Aybal A, Unal A, et al. Patient and technique survival and factors affecting mortality on peritoneal dialysis in Turkey: 12 years' experience in a single center. Perit Dial Int 2008;28:238-245.
20. Szeto CC, Kwan BC, Chow KM, et al. Repeat peritonitis in peritoneal dialysis: Retrospective review of 181 consecutive cases. Clin J Am Soc Nephrol 2011;6:827-833.
21. Pérez Fontan M, Rodríguez-Carmona A, García-Naveiro R, et al. Peritonitis-related mortality in patients undergoing chronic peritoneal dialysis. Perit Dial Int 2005;25:274-284.