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Clinical profile of patients under peritoneal dialysis treatment in the development of peritonitis in a public hospital in southern Jalisco

Perfil clínico de pacientes bajo tratamiento de diálisis peritoneal en el desarrollo de peritonitis en un hospital público de la zona sur de Jalisco

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Abstract

Objective. To describe the clinical profile and demographic characteristics of patients with chronic kidney disease (CKD) under treatment with PD who have developed peritonitis in a public hospital in the southern region of Jalisco. Material and methods. Cross-sectional study through clinical records of patients diagnosed with CKD under PD treatment. Contribution. CKD is an important public health problem in Mexico; it is one of the 10 leading causes of mortality in women in Mexico. The first line of treatment is peritoneal dialysis (PD); however, several extenuating factors can lead to its failure, being peritonitis the main cause of change to more complex and expensive treatments. The description of the epidemiological characteristics will provide information to the medical community for the creation of educational programs on PD hygiene and management focused on the specific needs of patients in the southern region of Jalisco.

Profile, Peritoneal dialysis, Peritonitis

Resumen

Objetivo. Describir el perfil clínico y características demográficas de pacientes con Enfermedad Renal Crónica (ERC) bajo tratamiento con DP que han desarrollado peritonitis derechohabientes de un hospital público de la región sur de Jalisco. Material y métodos. Estudio transversal analítico a través de expedientes clínicos de pacientes con diagnóstico de ERC bajo tratamiento con DP. Contribución. La ERC constituye en México un importante problema de salud pública, es una de las 10 principales causas de mortalidad en mujeres en México. La primera línea de tratamiento es la Diálisis Peritoneal (DP) sin embargo, diversas atenuantes pueden llevar al fracaso de esta, siendo la peritonitis la principal causa de cambio a tratamientos más complejos y costosos. La descripción de las características epidemiológicas aportará información a la comunidad médica para la creación de programas educativos de higiene y manejo de la DP enfocados en las necesidades específicas de pacientes de la región sur de Jalisco.

Perfil, Diálisis peritoneal, Peritonitis

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Introduction

Chronic kidney disease (CKD) is a public health problem due to its high incidence, prevalence and mortality rate, as well as its high socioeconomic cost. In Mexico, the annual incidence is approximately 45 thousand individuals, with a prevalence of 188 thousand people while the death rate is 54.1 per 100 thousand inhabitants. It is predicted that by 2025 there will be about 212 thousand cases of CKD with a death rate of almost 160 thousand deaths related to this disease (Figueroa-Lara A, *et al*., 2016).

According to data published in 2015 by the Ministry of Health, 59,754 patients were on dialysis, of which (59%) were treated with peritoneal dialysis (PD), 32% were treated with continuous ambulatory peritoneal dialysis (CAPD) and 27% with automated peritoneal dialysis (APD), while 41% were under treatment with hemodialysis (Sanchez-Cedillo A, 2020).

CKD represents an economic challenge for health systems, given that it is ranked as one of the most expensive diseases worldwide in terms of treatment-cost, it is estimated that if access to dialysis therapy were universal in Mexico, it would require an investment of more than 40% of the national budget allocated to the health sector (Cortés-Sanabria L, *et al*., 2017).

The progression of CKD is variable and depends on its etiology, in its terminal stage (ESRD) it is required to resort to renal replacement therapy (RRT), however these patients are 5 to 10 times more likely to die before reaching the terminal stage, added to this the possibility of survival is reduced when patients suffer from other comorbidities, especially in those under treatment with PD (Chang JH, *et al*., 2013).

PD is a procedure in which the peritoneum is used as a semi-permeable membrane in which a bag with dialyzing fluid is connected to a catheter previously placed in the peritoneal cavity through which constant dialysis solution exchanges are performed.

This treatment is performed at home either by the patient or by a family member, after selection, preparation and training in the technique, if this does not comply with the proper hygienic measures the patient is susceptible to infections that can lead to deterioration of the dialysis function and even lead to death (Mendez-Durán A, *et al*., 2010).

Peritonitis is one of the most common and frequent complications associated with PD, accounting for 7.6% of infections. The clinical picture of peritonitis presents with abdominal pain, nausea, vomiting, diarrhea and fever, leukocytosis and turbidity of the drained fluid. It is estimated that about two-thirds of PD patients will develop peritonitis within the first year, with a mortality rate of 2-5%. On the other hand, peritonitis can injure the peritoneum and affect the continuity of this treatment route, being one of the most common causes for migrating to hemodialysis, which increases the costs of diagnosis, hospitalization and treatment (López CM, *et al*. 2009).

Accurate diagnosis is necessary to establish guidelines for effective treatment, which allows reducing treatment costs when there are complications in PD. Peritoneal infection is the first cause of morbidity and the second cause of death in dialysis patients. There are several defined risk factors, such as the presence of Staphylococcus aureus, hypoalbuminemia, hypokalemia, vitamin D deficiency, prolonged use of antibiotics, obesity, medical procedures, exposure to pets and immunosuppression (Portolés J. *et al*, 2019).

In the last decade Mexico has shown a significant increase in the prevalence and incidence of CKD, unfortunately there is a lack of a registry of these patients, so the number of people diagnosed, their clinical profile, demographic characteristics, etc. is unknown (López 2009 Op. cit).

Like other countries, Mexico is immersed in an epidemiological transition; the aging of the population, unhealthy lifestyles and the various toxins found in the environment and in food have led to an increase in chronic degenerative diseases.

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Among the causes of CKD are vascular, glomerular, interstitial tubule and obstructive uropathies, however up to 50% of cases are due to comorbidities such as diabetes mellitus (DM), followed by systemic arterial hypertension (SAH) or a combination of both, This is the reason why the evolution of CKD is variable, from stage 1 to stage 5 known as end-stage renal disease (ESRD); however, statistics show that patients are 5 to 10 times more likely to die before reaching ESRD (López 2009 Op. cit).

The evidence from observational studies allows the development and application of disease management programs (DMPs) tailored to the clinical profile and sociodemographic characteristics, which are based on a systemic and population-based theoretical assumption for public health problems of high prevalence, complex control and involving high costs (Sánchez-Cedillo A, *et al*., 2020).

Methodology to be developed

Type of study

The study was quantitative type, because the level of analysis was considered descriptive, cross-sectional and analytical The study was conducted during the period from January 2017 to December 2019, the population was taken as the records in files of patients with CKD, with treatment in PD and who developed peritonitis attended a public institution in the South of Jalisco, Mexico.

The sample was by quotas, all patient records that met the inclusion criteria were considered in the sample. The sample consisted of n=211 patient records; the sociodemographic variables measured were: sex, age and place of origin. Clinical profile; causal agent of peritonitis, brand of dialysis bag, person responsible for care, patient comorbidity, number of refills, pharmacological treatment applied in peritonitis, time of initiation of renal replacement therapy, modality of therapy and number of episodes of peritonitis. As well as the characteristics of the appearance of peritonitis, the time of having been diagnosed with peritonitis and the objective manifestations.

The study variables considered were: the independent variable: PD as treatment of CKD, the and the dependent variable: peritonitis.

Instruments

The records of the files were used to collect the information, which is recorded by the health personnel in charge of patient surveillance and follow-up, as well as the laboratory results. It is important to mention that not all clinical records had complete information, so some tables do not show the complete sampled population.

Ethical considerations

The present research work is based on the Regulations of the General Health Law on research, taking as a basis the following articles: article 16 to protect the privacy of the person, article 17 was considered research without risk since only the data of the file were taken and the participation of the patient was not involved. Article 57 was also considered where informed consent was influenced by some authority, in this case the present study was authorized by the authorities of the institution to carry out academic and research work. For the development of the study, the application of the principles of the Declaration of Helsinki (beneficence, respect for human dignity and justice) of the World Medical Association for Medical Research Involving Human Subjects was considered. The present study was approved by the research ethics committee of the Centro Universitario del Sur of the University of Guadalajara CEI/T/06/21.

Statistical analysis

The statistical analysis was univariate descriptive for numerical data, frequency and percentage were used, and correlation tests such as Pearson's r were also run. The statistical tool Statistical Package for the Social Sciences v. 25.0 (SPSS) in Spanish and freely available was used for data processing.

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Results

Demographic characterization of the sample

A total of 211 participants from the southern part of the state (mainly Ciudad Guzmán, Zapotiltic, Gómez Farías, Tamazula, Tuxpan, Tecalitlán and Pihuamo) participated in this study; the demographic data can be found in Table 1.

In the present study there was an equal number of men and women, the predominant age of the patients is over 60 years (n=105), finally, the largest number of participants came from Ciudad Guzmán (n=104).

Clinical profile

The following characteristics were determined in the sample: the causal agent of the disease, the type of bag used by the patient, the person in charge of changing the patient's bag, the number of changes per day, the comorbidity detected in the patient and the causal agent of the peritonitis.

The most common causative agents of peritonitis in PD patients were *E. colli* (n=35) and *S. epidermidis* (n=33); however, in a large number of patients the causative agent was not identified because the required culture was not performed (n=112). As for the type of dialysis bag most frequently used, it was the Baxter type (n=112); on the other hand, the person in charge of changing the dialysis bag most frequently was a family member (n=148).

The comorbidities associated with patients with CKD were: Diabetes Mellitus type 2 and Systemic Arterial Hypertension together with the highest frequency (n=103), followed by Hypertension (n=54). In relation to the number of refills, the highest percentage of patients performed 4 fluid refills (n=108), while 43.1% (n=91) only performed one refill per day.

The main treatments applied for peritonitis were Amikacin and Cefotaxime (n=32), followed by Vancomycin, Amikacin and Cefotaxime (n=29), finally Vancomycin and Amikacin (n=15) as well as Vancomycin and Cefotaxime (n=15).

In the case of RRT initiation, 61.6% of the sample reported that they started therapy between 1 and 3 years ago (n=130), and finally the most popular therapy modality was DPA (n=108).

Among the sampled population, episodes of peritonitis occurred only once in 46% (n=97) of the patients, while 53.5% had 2 to 4 episodes since the diagnosis of CKD.

Table 7 shows the time since diagnosis of the patients, the highest percentage of patients had 1 to 3 years of diagnosis (n=126), 7.6% (16) had less than 1 year and 7.6 (16) had more than 5 years with the diagnosis. Among the symptoms of peritonitis, pain was the most frequent 40.8% (n=86) followed by pain and nausea with 19.9% (n=42) and finally 14.2% with pain and vomiting (N=42), while the most frequent clinical parameter was leukocytosis (n=157); finally, 80.1% (n=169) of the patients were still alive at the end of the present study.

Comparison between variables

In this section, by means of cross tables, data are shown in which some variables are integrated in order to know their behavior in this study.

The most frequent clinical parameters identified were leukocytosis in patients diagnosed between 1 and 3 years of age (n=94), followed by fever and leukocytosis in the same period of time of diagnosis (n=30). Leukocytosis appears as the clinical parameter that remains permanently present at any time.

In the case of patients who died, it can be seen that the older the patient, the higher the percentage of deaths.
As for the sex variable, men had a higher frequency of death than women.

In relation to the modality of therapy, there was a record of the same number of patients with type 2 diabetes mellitus and hypertension in the DPCA and DPA treatments (n=51).

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Among the treatments most frequently administered to patients with peritonitis were Vancomycin, Amikacin and Cefotaxime (n=27), followed by Amikacin and Cefotaxime (n=24), and finally Vancomycin and Amikacin (n=12), In the case of patient death, the most frequent treatment was Amikacin and Cefotaxime (n=8), followed by the application of "other" medication (n=6) and finally Amikacin and Ceftriaxone (n=5).

The relationship between the data on patients' chronic degenerative diseases and deaths shows that the most frequent comorbidity is type 2 diabetes mellitus and hypertension (n=80, n=22), for the case of patients who are still alive the next place is occupied by hypertension (n=48) and finally type 2 diabetes mellitus (n=12), in the case of death of patients, the next place was occupied by type 2 diabetes mellitus (n=7) and finally by hypertension (n=6).

In the present study it was observed that the majority of patients treated by the DPCA therapy modality (n=59) had only one episode of peritonitis, while the DPI therapy modality has the lowest frequency of peritonitis episodes (n=2), finally the rest of the subjects with different episodes of peritonitis, is located in the DPA treatment.

Regarding the relationship between the modality of therapy and the death of the patients, it can be observed that the patients who died more frequently were in DPA (n=23) and less frequently in DPI (n=0), in the case of the living patients the highest frequency of patients was in DPA treatment (n=84) and the lowest frequency in DPS (n=2).

Annexes

Variable	Frequency and percentage
Sex	
Male	103 (48.8%)
Female	108 (51.2%)
Age	
Under 40	32 (15.2%)
41 to 50 years old	27 (12.8%)
51 to 60 years old	47 (22.3%)
Over 60 years old	105 (49.8%)
Place of Origin	
Guzman City	104 (49.3%)
Gomez Farias	2 (.9%)
Other	36 (17.1%)
Pihuamo	7 (17.1%)
Tamazula	19 (9%)
Tecalitlán	10 (4.7%)
Tuxpan	13 (6.2%)
Zapotiltic	20 (9.5%)

Table 1 Demographic variables of participants
Source: Own elaboration

Variable Causative agent	Frequency and percentage
Candida	6 (2.8%)
E. beta hemolytic B	6 (2.8%)
E. colli	35 (16.6%)
Labsiella	2 (.9%)
Kiebsiella p.	2 (.9%)
Not found	112 (53.1%)
P. aeruginosus	1 (.5%)
Proteus m.	1 (.5%)
S. aeureus	10 (4.7%)
S. hemolytic	1 (.5%)
S. epiemidis	33 (12.6%)
S. pneumoniae	1 (.5%)

Table 2 Main causative agents of peritonitis in patients under treatment with peritoneal dialysis
Source: Own elaboration

Type of bag	Frequency and percentage
Baxter	112 (53.1%)
Pisa	98 (46.4%)
Who performed the exchange?	
Family member	148 (70.1%)
Patient	55 (26.1%)
Health personnel	8 (3.8)
Patient comorbidity	
Diabetes Mellitus type 2	19 (9%)
Diabetes Mellitus type 2 and Hypertension	103 (48.8%)
Diabetes Mellitus type 2, Hypertension and other disease	11 (5.2%)
Diabetes Mellitus type 2 and other disease	
Hypertension	1 (.5%)
Hypertension and other disease	
Other disease	54 (25.6%)
	1 (.5%)
	12 (5.7%)
Number of spare parts	
1 refill only	91 (43.1%)
2 to 3 refills	10 (4.7%)
4 refills	108 (51.2%)

Table 3 Clinical profile of patients under treatment with peritoneal dialysis who developed peritonitis
Source: Own elaboration

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Treatment	Frequency and percentage
Amikacin	3 (1.4%)
Amikacin, Cefotaxime	32 (15.2%)
Amikacine, Cefotaxime, Ceftiaxone	1 (0.5%)
Amikacin, Cefotaxime, Ceftiaxone, Imipenem	2 (0.9%)
Amikacin, Cefotaxime, Imipenem	1 (0.5%)
Amikacin, Cefotaxime, other	2 (0.9%)
Amikacin, Ceftriaxone	13 (6.2%)
Amikacin, Imipenem	2 (0.9%)
Amikacin, another	4 (1.9%)
Cefotaxime	1 (0.5%)
Cefotaxime, Imipenen	1 (0.5%)
Cefotaxime, other	1 (0.5%)
Cefotaxime	5 (2.4%)
Cefotaxime, Imipenen	1 (0.5%)
Cefotaxime, other	3 (1.4%)
Fluconazole	1 (0.5%)
Imipenem	5 (2.4%)
Another	14 (6.6%)
Vancomycin	7 (3.3%)
Vancomycin, Amikacin	15 (7.1%)
Vancomycin, Amikacin, Cefotaxime	29 (13.7%)
Vancomycin, Amikacin, Cefotaxime, Imipenem	2 (0.9%)
Vancomycin, Amikacin, Cefotaxime, other	3 (1.4%)
Vancomycin, Amikacin, Ceftriaxone	10 (4.7%)
Vancomycin, Amikacin, Imipenem	3 (1.4%)
Vancomycin, Amikacin, Imipenem, other	2 (0.9%)
Vancomycin, Amikacin, Other	2 (0.9%)
Vancomycin, Cefotaxime	15 (7.1%)
Vancomycin, Cefotaxime, Imipenem	2 (0.9%)
Vancomycin, Ceftriaxone	14 (6.6%)
Vancomycin, Imipenem	5 (2.4%)
Vancomycin, Imipenem, Fluconazole	3 (1.4%)
Vancomycin, another	6 (2.8%)

Table 4 Main treatments applied in peritonitis derived from peritoneal dialysis
Source: Own elaboration

TSR initiation	
Less than 1 year	16 (7.6%)
1 to 3 years	130 (61.6%)
1 to 5 years	13 (6.2%)
4 to 5 years	36 (17.1%)
5 to 10 years	1 (0.5%)
More than 5 years	15 (7.1%)
Therapy modality	
DCPA	100 (47.4%)
DPA	108 (51.2%)
DPI	2 (0.9%)

Table 5 Time of initiation of renal replacement therapy (RRT) and modality of peritoneal dialysis as therapy
Source: Own elaboration

Number of episodes of peritonitis	Frequency and percentage
1 episode	97 (46%)
2 episodes	75 (35.5%)
3 episodes	27 (12.8%)
4 episodes	8 (3.8%)
More than 4 episodes	1 (.5%)

Table 6 Percentage of episodes of peritonitis
Source: Own elaboration

Time with diagnosis	Frequency and percentage
Less than 1 year	16 (7.6%)
Less than 5 years	16 (7.6%)
1 to 3 years	126 (59.7%)
4 to 5 years	35 (16.6%)
5 to 10 years	1 (0.5%)
More than 5 years	15 (7.1%)
Symptoms of peritonitis	
Abdominal distention	8 (3.8%)
Pain	86 (40.8%)
Pain, abdominal distention	7 (3.3%)
Pain, nausea	42 (19.9%)
Pain, nausea, vomiting	12 (5.7%)
Pain, nausea, vomiting, abdominal distension	1 (0.5%)
Pain, vomiting	30 (14.2)
Pain, vomiting, abdominal distention	1 (0.5%)
Nausea	5 (2.4%)
Nausea, abdominal distention	1 (0.5%)
Vomiting	8 (3.8%
Clinical parameters	
Fever	2 (0.9%)
Fever, leukocytosis	46 (21.8%)
Leukocytosis	157 (74.4%)
The patient is still alive	
Yes	169 (80.1%)
No	41 (19.4%)

Table 7 Characteristics of the occurrence of peritonitis in patients on peritoneal dialysis and survival
Source: Own elaboration

Years in treatment under PD		<1 year	< 5 years	1 to 3 years	4 to 5 years	5 a 10 years	More than 5 years	Total
Signs of peritonitis	Fever	0	0	1	1	0	0	2
	Fever and leukocytosis	2	4	30	6	0	3	45
	Leukocytosis	13	10	94	27	1	11	156
	Total	15	14	125	34	1	14	203

Table 8 Clinical parameters of peritonitis and time to diagnosis of the patients
Source: Own elaboration

		< 40 years	41-50 years	51-60 years	> 60 years	Total
Does the patient live?	**Yes**	28	22	36	83	169
	No	4	5	11	21	41
	Total	32	27	47	104	210

Table 9 Relationship between age and morbidity due to peritonitis
Source: Own elaboration

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		Yes lives	Does not live	Total
Sex	Woman	84	18	102
	Man	85	23	108
	Total	169	41	210

Table 10 Relationship between sex and mortality in patients with peritonitis
Source: Own elaboration

		DCPA	DPA	DPI	Total
Patient comorbidities	Diabetes Mellitus type 2	9	9	0	18
	Diabetes Mellitus type 2 and Hypertension	51	51	1	103
	Diabetes Mellitus type 2, Hypertension and other disease	3	8	0	11
	Diabetes Mellitus type 2 and other disease	0	1	0	1
	Hypertension	25	28	1	54
	Hypertension and other disease	1	0	0	1
	Other disease	6	6	0	12
	Total	95	103	2	200

Table 11 Patient comorbidities according to modality of therapy
Source: Own elaboration

		Patient lives	Patient death	Total
Treatment	Amikacin	3	0	3
	Amikacin, Cefotaxime	24	8	32
	Amikacine, Cefotaxime, Ceftiaxone	1	0	1
	Amikacin, Cefotaxime, Ceftiaxone, Imipenem	1	1	2
	Amikacin, Cefotaxime, Imipenem	1	0	1
	Amikacin, Cefotaxime, other	2	0	2
	Amikacin, Ceftriaxone	8	5	13
	Amikacin, Imipenem	2	0	2
	Amikacin, another	3	1	4
	Amikacin, another	1	0	1
	Cefotaxime, Imipenen	0	1	1
	Cefotaxime, other	1	0	1
	Ceftriaxone	5	0	5
	Ceftriaxone, Imipenem	0	1	1
	Ceftriaxone, other	3	0	3
	Fluconazole	1	0	1
	Imipenem	4	1	5
	Another	8	6	14
	Vancomycin	6	1	7
	Vancomycin, Amikacin	12	3	15
	Vancomycin, Amikacin, Cefotaxime	27	2	29
	Vancomycin, Amikacin, Cefotaxime, Imipenem	2	0	2
	Vancomycin, Amikacin, Cefotaxime, other	2	1	3
	Vancomycin, Amikacin, Ceftriaxone	8	2	10
	Vancomycin, Amikacin, Imipenem	3	0	3
	Vancomycin, Amikacin, Imipenem, other	2	0	2
	Vancomycin, Amikacin, Other	2	0	2
	Vancomycin, Cefotaxime	11	3	14
	Vancomycin, Cefotaxime, Imipenem	1	1	2
	Vancomycin, Ceftriaxone	11	3	14
	Vancomycin, Imipenem	5	0	5
	Vancomycin, Imipenem, Fluconazole	3	0	3
	Vancomycin, another	6	0	6
	Total	169	40	209

Table 12 Relationship between the treatment of patients with peritonitis and associated mortality
Source: Own elaboration

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		Patient lives	Patient death	Total
Patient comorbidities	Diabetes Mellitus type 2	12	7	19
	Type 2 Diabetes Mellitus and Hypertension	80	22	102
	Diabetes Mellitus type 2, Hypertension and other disease.	10	1	11
	Diabetes Mellitus type 2 and other disease	0	1	1
	Hypertension	48	6	54
	Hypertension and other disease	1	0	1
	Other disease	9	3	12
	Total	160	40	200

Table 13 Relationship between comorbidities and mortality in patients on peritoneal dialysis
Source: Own elaboration

		DPCA	DPA	DPI	Total
Episodes of peritonitis	1	59	46	2	97
	2	35	39	0	74
	3	10	17	0	27
	4	3	5	0	8
	More than 4	1	0	0	1
	Total	98	107	2	207

Table 14 Number of episodes of peritonitis and their relationship to therapy modality
Source: Own elaboration

		Patient lives	Patient death	Total
Therapy modality	DPCA	82	18	100
	DPA	84	23	107
	DPI	2	0	2
	Total	168	41	209

Table 15 Relationship between dialysis modality and mortality
Source: Own elaboration

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Conclusions

In patients with CKD under PD treatment in patients from the southern region of Jalisco had peritonitis pictures during the first 3 years after diagnosis where the constant was that those in charge of performing the replacements were family members, on the other hand the predominance of *E. colli* and *S. epidermidis* bacteria found in the cultures performed allow establishing a base treatment for the infection according to clinical guidelines. The results obtained allow us to know more about the epidemiological characteristics of peritonitis secondary to peritoneal dialysis and thus create educational programs on hygiene and PD management according to the particularities of the population.

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