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Indication of change of renal replacement therapy from peritoneal dialysis to chronic hemodialysis in patients of a second-level hospital.

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Abstract

Introduction: The Mexican Institute of Social Security (IMSS) has registered more than 60 thousand patients in renal replacement therapy (RRT): 41.7% in hemodialysis programs and 58.3% in peritoneal dialysis (PD). This observational study describes the etiologies of the change from renal replacement therapy from peritoneal dialysis to hemodialysis in a group of patients in a second-level hospital in Mexico City.

Methods: The present observational study was carried out at the Regional General Hospital Number 1, "Dr. Carlos Mac Gregor Sánchez Navarro," of the IMSS, from February 2017 to March 2019. Patients with RRT with PD were included. Descriptive population variables and the etiology of the RRT change were determined. The sample was non-probabilistic. A univariate analysis is performed with measures of central tendency, frequencies, and percentages.

Results: 122 patients were included, 57.38% men, 54.57 ± 15.6 years of age. 57.38% remained on PD for more than one year. 90.16% had a family support network, and 52.46% had primary schooling. The average number of days of stay was 9.59 days. The primary etiology of the change in RRT was peritonitis, complex abdominal surgery (19.7%), adhesions and peritoneal sclerosis (19.67%), low-efficiency dialysis (16.39%), and wall defects or pleural communication (11.48%).

Conclusions: Infection of the peritoneal cavity and loss of peritoneal function were the leading causes of change in RRT.

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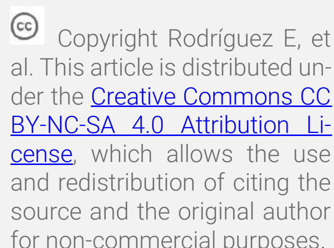

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Keywords:

MESH: Peritoneal Dialysis, Continuous Ambulatory; Peritoneal Dialysis; Peritonitis; Renal Dialysis; Hybrid Renal Replacement Therapy.

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Chronic kidney disease is a significant public health problem in Mexico. For the most part, the problem is a consequence of chronic noncommunicable diseases [1]. At the national level, a figure of 6.2 million diabetic patients with chronic kidney disease is estimated in its different stages; 98% of these patients are in stages 1-3, and 2% are in stages 4-5. In the Mexican Institute of Social Security (IMSS), slightly more than 60 thousand patients have been registered in replacement therapy, 25 thousand (41.7%) are in a hemodialysis program, and 35 thousand (58.3%) in the peritoneal dialysis program. It is estimated that the IMSS grants 80% of all dialysis at the national level, the Institute of Security and Social Services for State Workers (ISSSTE) 8%, the Ministry of Health and private centers 5%, and the rest of the sector 7%, which implies coverage of 74,400 kidney patients in stage 4 and 5 due to diabetes. According to estimates, the total number of patients with diabetic nephropathy is 124,000, which leaves a gap of 49,600 patients whose outcome is unknown.

On the other hand, to these statistics, we must add the cases with hypertension and other causes that constitute 40% of the spectrum of chronic kidney disease, 174 thousand patients [1 - 3]. The monthly cost per patient for hemodialysis service coverage is 488 USD (10 thousand Mexican pesos), and the cost for peritoneal dialysis is 244 USD (5 thousand Mexican pesos). Peritoneal dialysis for its home modality is the most chosen technique; however, the use of peritoneal dialysis as the first option has declined in several countries, including the United States of America. The failure of the technique plays a significant role as a conditioning factor for abandonment [4 - 6]. One study showed that 40% of patients switched from peritoneal dialysis to hemodialysis within the first year of replacement. The reasons were infectious complications (36.9%) and hypervolemia (18.5%) [5]. Studies are needed to identify the reason for transferring from a peritoneal dialysis program to hemodialysis, which is why this observational study was established in a single center in Mexico.

Materials and methods

Study design

The present study is observational, cross-sectional, and retrospective.

Scenery

The study was carried out in the nephrology service of the Regional General Hospital Number 1, "Dr. Carlos Mac Gregor Sánchez Navarro," of the IMSS of Mexico City. The study period was from February 1, 2017, to March 27, 2019.

Participants

Patients older than or equal to 18 years old with a diagnosis of chronic kidney disease stage 5-D in a peritoneal dialysis program with a medical indication for transfer to the chronic hemodialysis program were included. Patients with a temporary transfer were excluded. Patients without complete data in the clinical history that did not allow the analysis were excluded.

Variables

The variables were days needed to change the modality, time spent on peritoneal dialysis, sex, educational level, presence of a family support network, age, comorbidity, presence of peritonitis, history of complex abdominal surgeries, presence of defects of the abdominal wall, presence of multiple adhesions and sclerosis, and ultrafiltration failure.

Data sources/measurements

The variables were taken from the institutional clinical file and the records of the institutional dialysis committee. Ultrafiltration failure was defined as the inability to maintain an adequate volume balance in a patient treated with PD with more than two daily exchanges with 3.86/4.25% glucose and in the absence of excessive fluid intake with an inability to reach a minimum objective of ultrafiltration (UF) of 1 liter/day, which allows the state of euvolemia, obtained exclusively through the peritoneal route in anuric patients.

Biases

To avoid possible interviewer, information, and memory biases, the data were guarded at all times by the principal investigator with a guide and records approved in the research protocol. Observation and selection bias was avoided by applying the participant selection criteria. All the clinical and paraclinical variables of the period above were recorded. Two researchers independently analyzed each record in duplicate, and the variables were recorded in the database once their agreement was verified.

Studio size

The sample was nonprobabilistic, census type. For convenience, all possible cases were selected.

Quantitative variables

Inferential descriptive statistics were used. Scaled results are expressed as the means and standard deviations. Categorical data such as sex and the presence of peritonitis in proportions.

Statistical analysis

A descriptive analysis is performed. The statistical package used was SPSS 24.0 for PC (IBM Corp. Released 2016. Armonk, NY.)

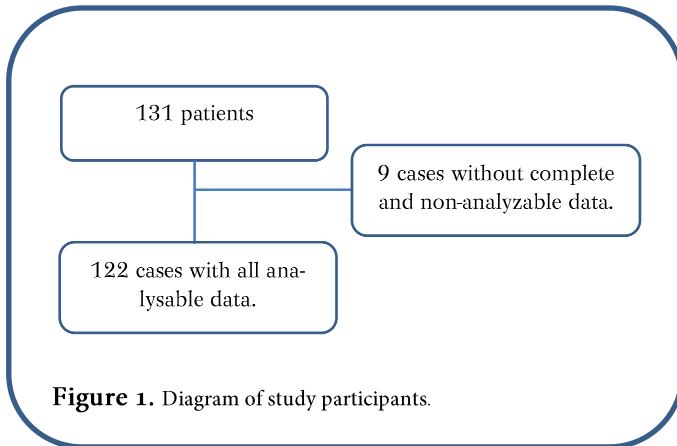

Figure 1. Diagram of study participants.

Results

Participants

A total of 122 patients entered the study. The diagram of the participants is presented in Figure 1.

Characteristics of the study population

A total of 122 cases, 70 men (57.38%) and 52 women (42.62%), were included. The mean age was 54.57 ±15.6 years. The length of stay on peritoneal dialysis was > 1 year in 70 cases (57.38%) and less than one year in 52 cases (42.62%). A total of 110 patients had a family support network (90.16%). It was observed that 64 patients had primary education (52.46%), 43 patients had secondary education (35.25%), and 13 had higher education (10.66%).

Comorbidities

Sixty-six patients (54.1%) had type 2 diabetes mellitus, 109 patients (89.34%) had arterial hypertension, 7 patients (5.74%) had cardiorenal disease, 12 patients (9.84%) had obesity, and 21 patients (17.21%) had other diseases in which subclinical or clinical hypothyroidism predominated. The mean number of days of stay was 9.59 ± 8.11 days (95% CI 8.15 – 11.03).

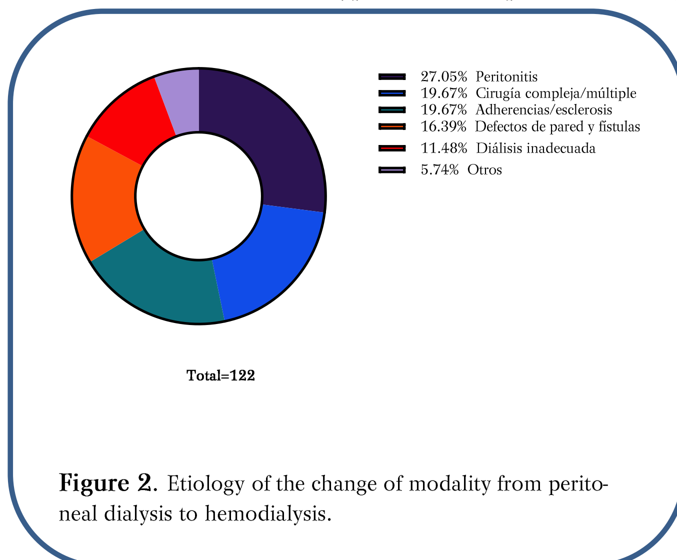

Figure 2. Etiology of the change of modality from peritoneal dialysis to hemodialysis.

Table 1. Indications for changing renal replacement therapy from peritoneal dialysis to chronic hemodialysis.

Indication	No. cases	%	95% CI for a proportion
Peritonitis	33	27.0%	26.34-27.76
Complex/multiple surgeries	24	19.7%	19.03-20.31
Adhesions/sclerosis	24	19.7%	19.03-20.31
Wall defects and fistulas	twenty	16.4%	15.80-16.99
Inadequate dialysis	14	11.5%	10.96-11.99
Others	7	5.7%	5.36-6.11

CI: Confidence Interval.

Indications for transfer to hemodialysis

The main reason was peritonitis in 33 patients (27.01%), followed by multiple or complex abdominal surgeries in 24 cases (19.67%), the presence of multiple adhesions and peritoneal sclerosis in 24 cases (19.67%); ultrafiltration failure and upper and lower peritoneal transport in 20 patients (16.39%); defects in the abdominal wall and peritoneal-pleural communication in 14 cases (11.48%); and various causes, such as AIDS, malnutrition, restrictive lung disease and patient decision making in 7 cases (5.74%) (Table 1 and Figure 2).

Subanalysis

No significant differences were found in the low survival of the technique at less than one year due to the presence or absence of family support groups (Table 2). Neither by the type of etiology (data not shown). The index days/bed of hospitalization was higher when peritonitis was present (Table 3).

Table 2. Analysis of association by groups with a support network and survival of the technique.

Variable	With AR n=110	Without AR n=12	*P*
<1 year	44 (40%)	8 (66.7%)	0.087
>1 year	66 (60%)	4 (33.3%)	

RA: support network. OR= 3 (95% CI 0.852-10.57)

Table 3. Average days/bed according to the indication of transfer to hemodialysis.

Indication type	No. of cases	Total days/bed	Average days/bed
Peritonitis	33 (27.0%)	464	14.06
C. Complex/Multiple	24 (19.7%)	258	10.75
Adhesions/sclerosis	24 (19.7%)	174	7.25
D. of the w. and fistulas	20 (16.4%)	84	4.2
Inadequate dialysis	14 (11.5%)	130	9.28
Others	7 (5.7%)	60	8.57

C: surgery. D of the W: Defects of the wall.

Discussion

In this study, peritonitis is presented as the main indication for transfer from peritoneal dialysis to chronic hemodialysis, according to its frequency, the association and impact of days of stay, and survival of the technique, in a 2-year follow-up period. Peritonitis accounts for 27% of the indications for changing renal function replacement therapy to peritoneal dialysis and is associated with the subsequent presence of multiple adhesions and peritoneal sclerosis; a sclerosed peritoneum has ultrafiltration failure. Together, peritoneal infection, adhesions, and ultrafiltration failure account for 58.2% of the loss of the functional peritoneal cavity.

Contrasting with a study conducted in the USA by Liberek T et al. [7], it was documented that infectious complications, including peritonitis and catheter infection, accounted for 36.9% of the indications for RRT change; hypervolemia associated with heart failure was 18.5%. Another study in Canada by Nassin S et al. [8] also presented peritonitis and ultrafiltration failure as the main indications of RRT change in patients on peritoneal dialysis programs.

In the present study, hypervolemia was included in the inadequate dialysis variable, although cardiovascular pathology was not a determining factor. In all studies, including the present one, age, sex, race, and the presence of a family support network were not risk factors for peritoneal dialysis technique failure. The causes that cause peritonitis are generally associated with the breakdown of asepsis in the connection technique of the dialysate bags, and this is associated with the degree of understanding and adherence that a patient has, where the level of education intervenes. For example, the low level of education represents an OR of 2.53 for the presence of peritonitis; however, in the present study, this variable was not significant.

Comorbidity in the dialysis population is generalized in various studies, predominating arterial hypertension, diabetes mellitus, heart or cardiovascular disease, and obesity; these findings are similar to those found by Weinhandl E (the USA, 2015) [9], Mendez Duran and Torres-Toledano (Mexico 2009 and 2017, respectively) [10].

Kidney disease is an entity that impacts the institutional economy, and much is reflected in the days/bed index. Torres-Toledano et al. in 2017, in their original contribution, make it clear that despite the improvement in care services, the costs are high; however, these improvements have increased life expectancy and, with it, the number of comorbidities, which in turn has a positive feedback effect but with a saturable health system. In this way, an average cost per hospitalization per patient is suggested to be 77,437 Mexican pesos (USD 3,780), which is necessary to reduce the days of stay as much as possible. The Mexican government, through the Ministry of Health, suggests a range of days of stay from 3.96 to 4.24, which contrasts with the present study of 9.54 days. Although it is an indicator of the efficiency of the provision of services and the use of bed resources, this index is determined by the complexity of the conditions treated since some factors are related to the condition and severity of the condition and comorbidities. In this study, peritonitis had the highest rate of the need for antibiotic coverage for 10 to 14 days. The Organization for Economic Cooperation and Development (OECD) reported average bed/day indices for Turkey and Mexico at approximately four days; Japan and Korea had the highest values, more significant than 16 days [11-15].

Some limitations of the present study were the biases typical of a retrospective study, the inability to determine causality, and the nonproportionality of various groups. The present study did not evaluate factors that led to the various processes that failed the technique, loss of cavity, and thus transfer to the hemodialysis program, which possibly should be clarified in future prospective and analytical studies, as well as the impact economic for health that implies a hospitalization and a change of RRT.

Conclusions

Together, peritoneal infection, adhesions, and ultrafiltration failure account for 58.2% of the loss of the functional peritoneal cavity and are the main reason for changing renal function replacement therapy in a group of patients with chronic kidney disease on renal replacement therapy. Renal function with peritoneal dialysis.

Abbreviations

RRT: renal function replacement therapy.
OECD: Organization for Economic Co-operation and Development.
OR: odds ratio.
IMSS: Mexican Institute of Social Security.
ISSSTE: Institute of Security and Social Services for State Workers.

Supplementary information

Supplementary materials have not been declared.

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Does not apply.

Author contributions

Ervin Rodríguez López: Conceptualization, Data Curation, Formal Analysis, Fundraising, Research, Methodology, Project Management, Resources, Software, Writing – original draft.
Christian Roberto Ortiz López: conceptualization, supervision, validation, visualization, and writing: review and editing.
Isaí Ayala García: conceptualization, supervision, validation, visualization, and writing: review and editing.
All authors read and approved the final version of the manuscript.

Financing

The authors provided research expenses. The laboratory studies were part of the regular institutional activity and were not expenses added to the institution or the patients.

Availability of data or materials

The data sets generated and analyzed during the current study are not publicly available due to participant confidentiality but are available from the corresponding author upon reasonable academic request.

Statements

Ethics committee approval and consent to participate

It was not needed.

Consent to publication

It does not apply when images or photographs of the physical examination or X-rays/tomographies/MRIs of patients are not published.

Conflicts of interest

The authors report having no conflicts of interest.

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