



Complications of Peritoneal Dialysis Catheter among End Stage Renal Disease Patients

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ABSTRACT

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Background: Renal failure (RF) is global health problem, which strikes millions of people worldwide, and causing either a lifetime severe disability or death. Renal failure is treated in several ways, one of which is peritoneal dialysis, but this method is accompanied by many complications that affect the patient's life.

Objectives: A study focuses on the common complications associated with peritoneal dialysis and to find out relationship between the patient peritoneal dialysis catheter complications and their demographic characteristics.

Methodology: A descriptive cross-sectional study was carried out through the present study in order to achieve the early stated objectives. The study is conducted in Al-Najaf City/Al-Najaf Al-Ashraf Health Directorate/ Al-Furat Al-Awsat Center for Peritoneal Dialysis and Al-Najaf Teaching Hospital. The study was begun from October, 9th, 2024 to March, 1st, 2025. Data collected by use constructed questionnaire, which consisted of 3 parts, the first part was concerning with socio-demographic characteristics which includes (6) items and the second part was concerning with Clinical data that have (3) items, finally the last part of questionnaire which include catheter site complication.

Results: This cross-section study includes 80 patients under peritoneal dialysis, 41 males and 39 females. 45% of patients had bleeding as an early complication of peritoneal dialysis and 51.3% of patients had peritonitis as a late complication of peritoneal dialysis.

Conclusion: The results of this study conclude that patients subject to peritoneal dialysis are exposed to many complications, but most common complication is bleeding and peritonitis. Also, study conclude that a hypertension is the most common disease among peritoneal dialysis patients.

Keywords: Complications, Peritoneal Dialysis, Catheter, ESRD.

INTRODUCTION

End-stage renal disease (ESRD) is the end stage of chronic kidney disease, which is an important public health problem worldwide with high incidence, poor prognosis, high healthcare costs and high socioeconomic burden. With the overall ageing of the population, the prevalence of ESRD is on the

rise worldwide. Dialysis often needs to be performed urgently in patients with ESRD due to silent disease, low health awareness and late referral (Al-Hchaim et al., 2019; Zang et al., 2020).

There are several treatment methods for patients with kidney failure. These methods include hemodialysis, peritoneal dialysis, and kidney transplantation. Due to the limitations of hemodialysis and its complications such as the high prevalence of cardiovascular disease and hypertension, peritoneal dialysis has become more important. Peritoneal dialysis has been used to treat end-stage renal disease (ESRD) since 1976 (Khaksar et al., 2021).

Urgent-start dialysis refers to urgent initiation of dialysis for ESRD patients with no pre-established functional vascular access or peritoneal dialysis (PD) catheter. Hemodialysis (HD) is preferred in most centers with a high rate of central venous catheter (CVC) use at the time of initiating dialysis among HD patients (Bernardini, 1999). There is a significantly increased risk of infectious complications, thrombosis, and other complications associated with CVC use which negatively affects patient prognosis. Within the last decade, urgent-start PD has gained considerable interest amongst nephrologists. Several publications have provided assurances that urgent start PD is indeed feasible and can serve patients well (Jin et al., 2016).

There are many complications for PD infectious and noninfectious complications. PD-related infections include peritonitis, exit site infections, and tunnel infections. According to the 2022 US Renal Data Systems report, peritonitis episodes accounted for 5.9 hospital admissions per 100 patient-years, decreased from 15.1 admissions per 100 patient-years a decade ago (Khan, 2023). Bleeding and organ perforation can complicate the PD catheter insertion. Bleeding from trauma of the blood vessels located in the abdominal wall is frequent, it is favored by anticoagulants, antiaggregant, thrombocytopenia in patients with already increased bleeding risk due to uremia and presents as hemoperitoneum or pericatheter bleeding. In majority of cases is minor, auto limited and it is treated conservatively [9,10]. Major bleeding complicates around 2% of interventions due to direct

blood vessel injury or rectus sheath hematoma (Crabtree and Chow, 2017). In these cases, treatment consists in exploratory surgery or angiographic embolization, in addition to transfusion support. Intestinal or urinary bladder perforation are rare events but are life-threatening and they necessitate a high index of suspicion for rapid diagnosis and treatment. Infections are the major complication of PD on short and long term because they represent the leading cause of permanent technique failure (20% in the first year) Inflow or outflow obstruction is suspected when the patient is unable to inflow dialysate by gravity, or develops a sudden prolonged drain time, or has inadequate drain volume (Iorga et al., 2024).

As a nurse, my involvement in avoiding PD complications is varied. To begin, I will regularly evaluate the patient's exit site and tunnel for symptoms of infection, such as redness, swelling, or discharge, and report any irregularities to the physician. I will also teach the patient about proper exit site care, such as daily cleaning and dressing changes, to help avoid infection. In addition, I will check the patient's dialysate effluent for symptoms of peritonitis, such as murky or bloody fluid, and take cultures as appropriate. To avoid catheter-related issues, I will make certain that the patient's PD catheter is appropriately fastened and immobilized, and that the patient avoids heavy lifting or bending. I will also teach the patient on the necessity of keeping a clean.

AIMS OF THE STUDY

The Aim of this study was focus on dtermination of complications associated with peritoneal dialysis.

METHODOLOGY

Study design and setting

This cross-sectional study was conducted in Al-Najaf Al-Ashraf Health Directorate/ Al-Furat Al-Awsat Center for Peritoneal Dialysis and Najaf Al-

Ashraf Teaching Hospital. The study was begun from October, 9th, 2024 to March, 1st, 2025.

Data collection and sample of the study

- A non-probability (Purposive) sample of Eighty patients Under peritoneal dialysis with inclusion criteria which include
- Patients currently undergoing peritoneal dialysis.
- Adults aged 18 years or older.
- Able to communicate effectively (sufficient cognitive and linguistic ability to respond to the structured interview). And exclusion criteria include:
- Critically ill patients or those too unstable to complete the interview during the data collection period.
- Patients who declined to provide informed consent for participation.
- Individuals not currently receiving peritoneal dialysis.

Data were collected using structured performance forms designed specifically for this study and using structured interview technique with individuals who were interviewed individually at the Peritoneal Dialysis Center and Najaf Teaching Hospital using the English version of the questionnaire in the period between December, 22nd, 2024 to February, 14th, 2025.

Validity of the Instrument

A study validity conducted by a group of experts who have more than 10 years of experience in nursing field. Content validity was used to validate the questionnaire note that the experts modified the questionnaire by deleting or adding some paragraphs to appear in its final form for collecting the sample.

Statistical analysis

The data of the current study towards peritoneal dialysis complications were analyzed using the popular statistical analysis program, which is SPSS (Statistical Package for Social Sciences), specifically the 25th version of it, which was released in 2017, as well as the statistical analysis system for the application and Excel.

Descriptive data analysis: were involved the following: Frequency and percentage tables and Bar chart.

Inferential data analysis

- **ANOVA:** Repeated measures of ANOVA were used to find relationship between socio-demographic, medical history and complications.

RESULTS

Table (1) shows that the majority of the study sample is within age groups (59-68), and accounted for (20.0%). With Mean \pm SD (45.21) and (20.54), also shows the majority of the study sample (51.3%) are males and the remaining are females (48.8%). Relative to subject, socioeconomic status, the results indicate that the majority of study sample (60.0%) were satisfied to some extent.

Finally, the study results indicate that the high percentage (32.5%) of study sample are primary school graduated in related to the level of education.

Table (2) shows the medical history of 80 patients who went through peritoneal dialysis and was divided by referral type, comorbidities, and smoking status. Almost half (46.3%) of the patients were referred urgently, whereas the other half (53.8%) was elective referrals. High blood pressure was the most frequent comorbidity (65.0%), being diagnosed in more than half of the patients, then followed by diabetes mellitus (42.5%) and cardiac disease (38.8%). Smoking status wise, 26.3% of patients were regular smokers, while 17.5% were just passive smokers, the majority of the patients did not smoke and were not around smokers. This data shows the existence of high blood pressure and diabetes in this group of patients and also the existence of quite a few people who came to the emergency department, which could possibly help medical management as well as prevention practices.

Table (3) depicts the frequencies of early catheter complication in patient with Peritoneal dialysis: The results showed that the percentage of patients suffering from complications is less than those who do not suffer from them. about 12 (15.0%) of patients have infection at the catheter insertion site, 11 (13.8%) of patients have catheter

displacement, 29 (36.3 %) of patients have catheter blockage, 19 (23.8%) of patients have leakage at exit site, 36 (45.0%) of patients have bleeding, 33 (41.3%) of patients have clotting, finally, only 2 (2.5%) of patients have catheter adhesion.

Table (4) show the frequencies of late catheter complication in patient with Peritoneal dialysis: The results showed that the percentage of patients suffering from complications is less than those who do not suffer from them except with peritonitis, about 41 (51.3%) of patients have peritonitis, 6 (7.5%) of patients have encapsulating peritoneal sclerosis, 29 (36.3 %) of patients have catheter malfunction, 35 (43.8%) of patients have exit site infection and only 10 (12.5%) of patients have hernia at catheter exit site.

Table (5) shows the ANOVA results that have revealed a significant link between different factors and complications associated with peritoneal dialysis (PD). The study indicated that the referral type of peritoneal dialysis was significantly associated with such complications as catheter migration, catheter occlusion, leakage at the exit site, bleeding, clotting, catheter malfunction, and exit site infection when $p < 0.05$. Not to be outdone, the study's findings were that active smoking and its effects on catheter blockage, leakage at the exit site, and clotting were as significant as while the gender of the participant was significantly associated with leakage at the exit site. Furthermore, diabetes mellitus also showed a statistically significant correlation with leakage at the exit site. Hence, these outcomes give food for thought that referral type, smoking status, gender, and diabetes mellitus are primary causes of PD-related complications, which means more targeted interventions and regular checkups are required in these areas.

DISCUSSION:

Part I: Discussion for Patients' Socio-Demographic:

Renal failure is becoming a serious health issue in developing countries. It is a disorder that affects millions of individuals around the globe, and many patients need for peritoneal dialysis, so this can be associated with complications in the abdominal cavity related to the catheter. The complication incidence is influenced by patients' socio-demographic information. (Researcher).

The results of the present study show that the higher percentages of the study sample are elderly. This is because older adults are more likely to have underlying health conditions, weakened immune system, comorbidities, and increased vulnerability to infections, which can lead to peritonitis and as well as other conditions associated with older adults such as DM, HTN, CVD, and AKI, which can lead to kidney problems (Al-Hchaim and Mohammed, 2023). (Among 1953 patients, (33.2%) in elderly and (29.0%) in younger developed at least one episode of peritonitis. Comparing with younger patients, elderly ones had a higher peritonitis rate. This result come along with (Wu, et al. 2019), they studied "Incidence and risk factors of peritoneal dialysis-related peritonitis in elderly patients: A retrospective clinical study" found that the high percentage of a patient (33.2%) was elderly. Regarding to the study subjects' gender, the results indicate, that the majority of the study sample are males, due to several factors.

Firstly, hormonal differences, such as lower estrogen levels, may contribute to a higher risk of cardiovascular diseases Which in turn, in the long run, leads to kidney failure and thus to dialysis. Secondly, more men than women start renal replacement therapy Addition to, occupational exposures and stress levels may contribute to the gender disparity in health condition. Finally, unhealthy life choices such as smoking, data. This result supported by (Kitterera et al., 2017) in their study "Gender-specific differences in peritoneal dialysis"

they found that A total of 745 patients (315 women and 430 men and suggest that technical survival rates were significantly better in female, compared to men over three decades and death due to cardiovascular events and PD associated peritonitis decreased significantly over the three decades in both sexes.

The present study also describes the level of education, the results of the study showed low education or a limited level of education (initial), low levels of education can be attributed to several factors. Firstly, Social norms in case of female patients Secondly, older individuals might have faced personal or familial circumstances that hindered their ability to pursue education, such as financial constraints or responsibilities. Thirdly, historical events, such as war or political instability, could have disrupted educational systems, affecting older generations disproportionately. Fourthly, societal attitudes towards education might have been different in their time, with less emphasis on formal education. Lastly, personal choices or priorities might have led some to prioritize other aspects of life over education.

This result is consistent with (Kim, et al., 2017), found that lower education was a significant risk factor for peritonitis and technique failure, it was not associated with increased mortality in PD patients. Comprehensive training and multidisciplinary education may overcome the lower education level in PD.

With respect to the study sample, economic situation of patients who undergo peritoneal dialysis, the study showed that they are satisfied to some extent, It allows them to continue working or managing daily responsibilities since it can be done at home, reducing transportation costs, Some patients also benefit from government or insurance support, easing financial strain, however, home modifications, and potential caregiving needs can still be a burden, limiting full satisfaction.

Part II: Discussion of the Patients' Medical History:

According to the duration of treatment by peritoneal dialysis, the results of the study showed that the majority of patients (20%) had a duration of 12 months, could be due to a combination of factors. While it's possible that some patients experienced despair over their condition, related to the time they started PD the study shows that most patients start PD in elective way.

For chronic diseases, most patients undergoing PD suffer from hypertension and cardiovascular diseases (Ortega and Materson, 2011) in their research "Hypertension in peritoneal dialysis patients: epidemiology, pathogenesis, and treatment": Hypertension is prevalent in an estimated 29% to 80% of patients treated with peritoneal dialysis (PD). Cardiovascular disease represents the most common cause of mortality in this population and hypertension (HTN) plays an important role).

Part III: Discussion of the Patients' Peritoneal Catheter Complication:

The patient who is treated with dialysis as a result of renal failure through Peritoneal dialysis suffers from many complications that accompany peritoneal catheter, including early complications and others that occur late after a long period. The results of this study showed that patients who suffer from complications are less likely than patients who do not suffer. from early complications the most common complication is bleeding, and the most common complication among late complications is peritonitis.

Iorga et al., (2024), studied the "Evaluation of short-term complications in laparoscopic peritoneal dialysis catheter placement – a single tertiary center experience" they reported that the most frequent complication was infection (peritonitis 35%, catheter exit site infection 30.4%), followed by peri-catheter leak (21.7% of total complications). Catheter migration, hernia, and significant bleeding were rare events (4.3% of total complications each). All complications were managed by medical treatment,

except two cases which required replacement of the catheter.

Also, Khaksar et al., (2021), found that 68 patients (24.1%) had an early complication of surgery. Surgical complications included: Catheter exit-site infections in 20 patients (7.1%), peritonitis in 18 patients (6.4%), catheter exit-site leakage in 17 patients (6%), catheter occlusion without migration in 16 patients (5.7%), catheter migration in 7 patients (2.5%), and hemoperitoneum in 7 patients (2.5%).

CONCLUSIONS:

The results of this study conclude that patients subject to peritoneal dialysis are exposed to many complications, but most common complication is bleeding and peritonitis. Also, study conclude that a hypertension is the most common disease among peritoneal dialysis patients.

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Ethical Declaration: The researcher get a consent from the Adult Nursing Branch in the Faculty of Nursing / University of Kufa. Additional consent is attained from Al-Najaf Al-Ashraf Health Directorate/ Al-Furat Al-Awsat Center for Peritoneal Dialysis and Najaf Al-Ashraf Teaching Hospital in in order to interviewing each subject. The consent had made it easy to arrive the institutions and meet the nurses for

the necessary data after taking their permission to participate in the study.

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TABLES:

Table (1): The observed frequencies and percentages of PD patients' groups according to socio-demographic data

Socio-demographic	Categories	Frequency	Percent
Age	<= 18	13	16.3
	19 - 28	13	16.3
	29 - 38	3	3.8
	39 - 48	14	17.5
	49 - 58	10	12.5
	59 - 68	16	20.0
	69+	11	13.8
	Mean±SD	45.21	20.541
Gender	Male	41	51.3
	Femal	39	48.8
Socio-economic status	Stisfied	13	16.3
	Satisfied to some extent	48	60.0
	Unsatisfied	19	23.8
Educational level:	Do not read and writes	15	18.8
	Read and writes	15	18.8
	Primary school	26	32.5
	Secondary school	9	11.3
	Institute	4	5.0
	College and Postgraduate	11	13.8
Total		80	100.0

Table (2): Distribution of mechanical ventilation patients' according to the clinical data

Medical History		Categories	Frequency	Percent
Referral type for Peritoneal dialysis		Emergency	37	46.3
		Elective	43	53.8
Comorbidities	Hypertension	Yes	52	65.0
		No	28	35.0
	Diabetes mellitus	Yes	34	42.5
		No	46	57.5
	Cardiac disease	Yes	31	38.8
		No	49	61.3
Smoking	Active	Yes	21	26.3
		No	59	73.8
	Passive	Yes	14	17.5
		No	66	82.5
Total			80	100.0

Table (3): The observed frequencies and percentages of Peritoneal Dialysis Catheter Complications (Early Complication)

Early Complications	Response	Frequency	Percent
Infection at the catheter insertion site	Yes	12	15.0
	No	68	85.0
Catheter displacement	Yes	11	13.8
	No	69	86.3
Catheter blockage	Yes	29	36.3
	No	51	63.8
Leakage at exit site	Yes	19	23.8
	No	61	76.3
Bleeding	Yes	36	45.0
	No	44	55.0
Clotting	Yes	33	41.3
	No	47	58.8
Catheter Adhesion	Yes	2	2.5
	No	78	97.5
Total		80	100.0

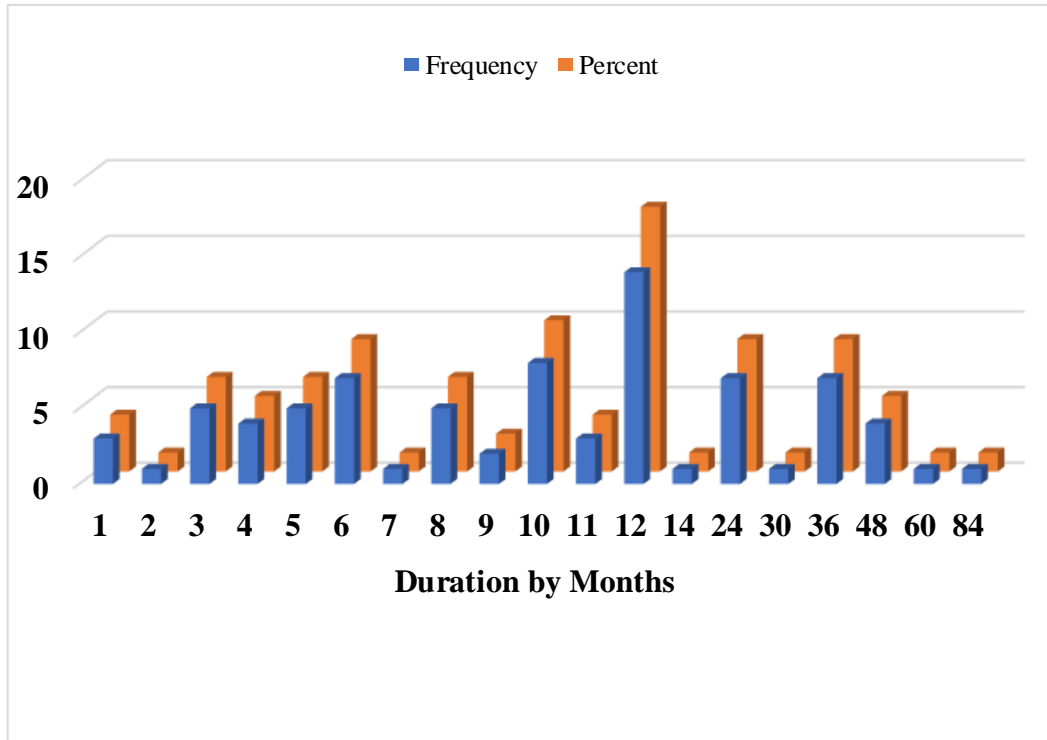


Figure (1): distribution of patients according to the duration of treatment by peritoneal dialysis\ Month

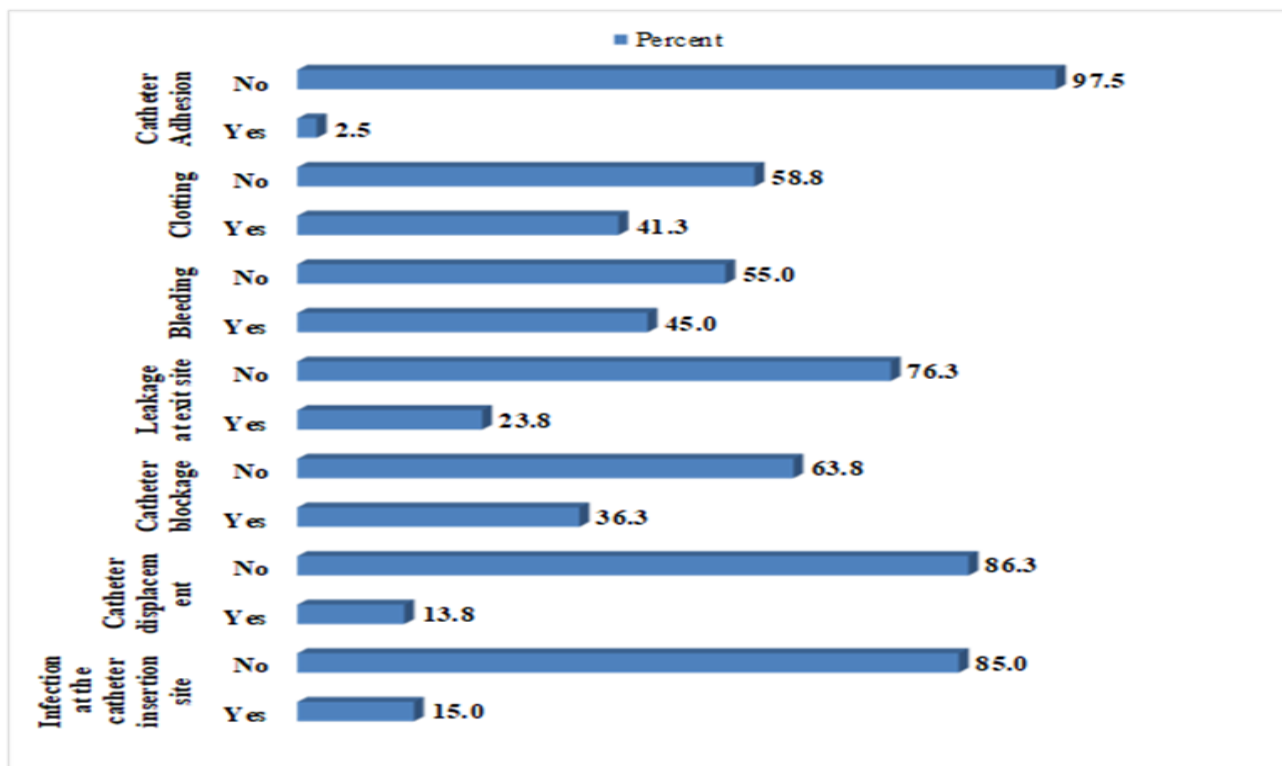


Figure (2): distribution of patients according to the Peritoneal Dialysis Catheter Complications (Early Complication)

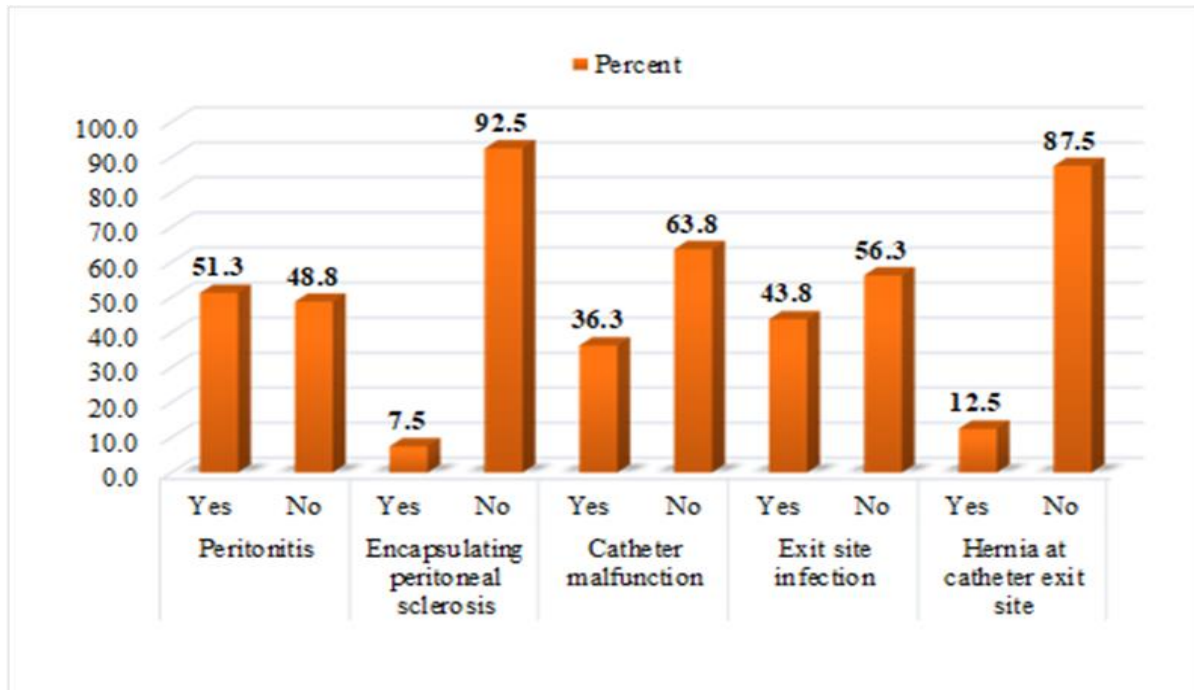


Figure (3): distribution of patients according to the Peritoneal Dialysis Catheter Complications (Late Complication)

Table (4): The observed frequencies and percentages of Peritoneal Dialysis Catheter Complications (Late Complication)

Late Complications	Response	Frequency	Percent
Peritonitis	Yes	41	51.3
	No	39	48.8
Encapsulating peritoneal sclerosis	Yes	6	7.5
	No	74	92.5
Catheter malfunction	Yes	29	36.3
	No	51	63.8
Exit site infection	Yes	35	43.8
	No	45	56.3
Hernia at catheter exit site	Yes	10	12.5
	No	70	87.5
Total		80	100.0

Table (5): Relationship between Demographic data and medical history with Peritoneal Dialysis catheter complications

	ANOVA (p-value)					
	Age (years)	Gender	Duration of PD treatment	Referral type for Peritoneal dialysis	Diabetes mellitus	Active smoking
Infection at the catheter insertion site	0.112	0.252	0.178	0.734	0.492	0.551
Catheter displacement	0.595	0.383	0.515	0.007*	0.662	0.519
Catheter blockage	0.205	0.602	0.363	0.000*	0.213	0.004*
Leakage at exit site	0.215	0.025*	0.543	0.011*	0.001*	0.016*
Bleeding	0.419	0.842	0.549	0.036*	0.095	0.782
Clotting	0.529	0.065	0.186	0.000*	0.069	0.025*
Catheter Adhesion	0.841	0.972	0.743	0.189	0.098	0.399
Peritonitis	0.121	0.186	0.340	0.647	0.124	0.261
Encapsulating peritoneal sclerosis	0.537	0.439	0.947	0.850	0.704	0.686
Catheter malfunction	0.614	0.326	0.778	0.000*	0.880	0.075
Exit site infection	0.471	0.637	0.274	0.050*	0.613	0.682
Hernia at catheter exit site	0.414	0.154	0.635	0.077	0.613	0.777