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INCIDENCE AND SPECTRUM OF CONTINUOUS AMBULATORY PERITONEAL DIALYSIS (C.A.P.D.) PERITONITIS

General Medicine

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ABSTRACT

Background: Peritonitis is a well-known cause of mortality in peritoneal dialysis (PD) patients. We carried out a retrospective study to disclose the clinical spectrum and risk profile of peritonitis-related mortality.

Aim: To study the microbiological spectrum in continuous ambulatory peritoneal dialysis (CAPD) patients.

Methods: This study was conducted at Department of Medicine, Maharani Laxmi Bai Medical College, Jhansi, on approximately 50 patients, who was present to Department for Continuous Ambulatory Peritoneal Dialysis over a period of 15 months from June 2017 to October 2018.

Results: Majority of the patients was male i.e., 32 (64%) out of 50 and 18 patients (36%) was females. Majority of the cases was in the age group of 31-40 years (26%) followed by 41-50 and 51-60 (22%) respectively. In age group 61-70 years, 8 (16%) cases was found and only 1 (2%) cases was found in >70 years age group. Lower socio-economic status 41 (82%) followed by middle socioeconomic status, 9 (18%) and 0 cases found in upper status. Out of 50 cases, 22 (44%) cases was present with sign and symptoms of peritonitis and in rest 28 (56%) cases there was no sign and symptoms of peritonitis. 23 (46.0%). Patients undergoing CAPD in duration of 10-20 months followed by 17 (34) in duration <10 months and 10 (20%) patients in duration 21-30 months group was found. Mean duration of CAPD was 13.54+18.19 (range 2-30) patients months. 28 (56%) patients no episodes of peritonitis was seen, 2 episodes of peritonitis seen in 13 (25%) followed by 1 episode of peritonitis in 9 (18%) patients. Out of 35 dialysate culture, 25 (71.43%) patients was found culture positive and 10 (28.57%) patients was found sterile. On gram staning 6(17.15%) patients was gram positive cocci and 3 (8.57%) patients gram negative bacilli and on KOH mount 2 (5.71%) patients was found with yeast cells and no acid-fast bacillus was detected with ZN staining. Majority of organism was gram positive 17 (56.67%) followed by gram negatve 9 (30%) and fungal 4 (13.33%) found. No myobacterials Spp. was found out of 30 isolated organism. Majority of organism gram positive 17 (56.67%) [Staphylococcus aureus 8 (26.67%); coagulase negative staphylococcus (CoNS) 7 (23.33%); Enterococcus 2 (6.67%)]; followed by gram negative 9 (30%) [Escherichia coli 3 (10.0%)] and Fungal 4 (13.33%) [Candida spp. 3 (10.0%); Rhizopus spp. 1 (3.33%)] was found. The organism of skin origin 18 (60%) followed by fecal origin 9 (30%) and in environmental origin 3 (10%) was found.

Conclusion: The rates of gram positive peritonitis was higher than that of gram —ve peritonitis. The higher incidence of gram +ve peritonitis in CAPD patients was due to the break in sterile techniques. The peritonitis rate was 0.62 episodes per patient's year.

KEYWORDS

Continuous Ambulatory Peritoneal Dialysis, Nutritional Status, Protein-energy Malnutrition.

INTRODUCTION

Peritoneal dialysis (PD) is a type of dialysis that uses the peritoneum in a person's abdomen as the membrane through which fluid and dissolved substances are exchanged with the blood[1]. It is used to remove excess fluid, correct electrolyte problems, and remove toxins in those with kidney failure[2]. Peritoneal dialysis has better outcomes than hemodialysis during the first couple of years[3].

Continuous ambulatory peritoneal dialysis (CAPD) ought to be the ideal modality for renal replacement therapy as it provides superior rehabilitation, better quality of life, averts need for expensive machines and allows for home-based therapy especially for patients immense distance from haemodialysis units exists[4].

Continuous ambulatory peritoneal dialysis (CAPD) is being widely used as an alternative to hemodialysis, after its inception by Papovich et al[5], in 1976. Even though peritoneal dialysis provides many advantages compared to hemodialysis, the incidence of complications like peritonitis and catheter malfunction can be as high as 70%. The advantages of peritoneal dialysis include more liberal dietary intake of protein, potassium, sodium and fluids, elimination of need for anticoagulation, increased patient mobility and lower cost. Hematocrit levels are often higher than for patients receiving and gradual and continuous ultra filtration may provide better blood pressure control. Because it is a form of self-care, peritoneal dialysis promotes patient independence.

Peritoneal cavity was first used for dialysis in guinea pig in 1923 by Ganter G et al[6] described intermittent peritoneal dialysis (IPD) in 1961, in which dialysis fluid was infused into the peritoneal cavity and then drained out intermittently, in patients with renal failure.

Peritonitis: Two of the following features are essential for the clinical diagnosis o f peritonitis:

1. Clinical signs and symptoms of peritoneal inflammation, like pain, discomfort, tenderness, rebound tenderness, fever, nausea/ vomiting and diarrhea or constipation.
2. Cloudy outflow fluid (WBC > 100 cells/mm3), poor drain, loss of ultra-filtration or bloody effluent.
3. Positive culture or Gram's stain

One episode of peritonitis in 12-24 months is acceptable according to US Registry Dialysis Data.

Peritonitis is still the leading cause of technique failure in continuous ambulatory peritoneal dialysis (CAPD) patients[7]. The incidence of peritonitis depends on the factors such as age, race, educational background, environment, and type of dialysis system used[8]. But the outcome depends on the organisms isolated[9]. Several studies have shown a decreasing trend in the gram-positive peritonitis and an increasing trend in the incidence of gram-negative peritonitis[10]. The microbiological spectrum of PD-related peritonitis seen in patients from developing countries such as India may be different from that observed in patients from developed countries, and it may be attributed to the difference in social, environmental, educational, and financial background, and surrounding climate of the patients[11-12].

All dialysis treatments include a certain risk of infection because of the decreased immune defenses of patients in established renal failure (ERF) and because dialysis techniques increase the potential of microbial contamination. Peritoneal dialysis (PD), and in particular continuous ambulatory PD (CAPD), is associated with a high risk of infection of the peritoneum, subcutaneous tunnel and catheter exit site[12].

PD peritonitis usually has an excellent prognosis with resolution within days but it can lead occasionally to the much dreaded sclerosing can with encapsulated peritonitis (SEP)[14].

The incidence of peritonitis has markedly decreased since the lates 1980s, but the infection remains a significant complication of chronic PD. Very low rates of peritonitis in a program are possible if close attention is paid to the causes of peritonitis and protocols implemented to reduce the risk of infection. Although several organisms are involved in causing PD associated infections (PDAI), coagulase negative staphylococci (CoNS) appear to be the most common[15].

Peritonitis remains the most common complication of CAPD in treated patients with end-stages renal disease (ESRD). Globally, CAPD-related peritonitis rates are estimated to be 0.24-1.66 episodes per patients year, exceeding, in many low-income and middle-income countries, the guidelines recommendation of not more than 0.5 episodes per patients-years.

AIM AND OBJECTIVES

- To study the incidence and spectrum of peritonitis in CAPD patients during 15 months period in Bundelkhand Region.
- To study the microbiological spectrum in continuous ambulatory peritoneal dialysis (CAPD) patients

MATERIAL AND METHODS

Sources:

This study was conducted at Department of Medicine, Maharani Laxmi Bai Medical College, Jhansi, on approximately 50 patients, who was present to Department for Continuous Ambulatory Peritoneal Dialysis over a period of 15 months from June 2017 to October 2018.

Inclusion criteria:

We include patients undergoing CAPD (Continuous Ambulatory Peritoneal Dialysis).

Exclusion criteria:

- Patient not willing to participate

During peritoneal dialysis:

- The dialysate flows into your abdomen and stays there for a prescribed period of time (dwell time) - usually four to six hours
- Dextrose in the dialysate helps filter waste, chemicals and extra fluid in your blood from tiny blood vessels (capillaries) in the lining of your abdominal cavity (peritoneum)
- When the dwell time is over, the solution - along with waste products drawn from your blood - drains into a sterile collection bag
- The process of filling and then draining your abdomen is called an exchange. Different methods of peritoneal dialysis have different schedules of exchange.

The two main schedules are:

- Continuous ambulatory peritoneal dialysis (CAPD)
- Continuous cycling peritoneal dialysis (CCPD)

Approximately 2 litres of dialysis fluid is infused into the abdomen through a special tube called a PD catheter. This process is called 'infusion'. The cleaning process uses the membrane in your abdomen as a natural filter. Waste products and excess water are removed from your body into the dialysis fluid through the peritoneal membrane. This process is called 'dwell time. After 4-6 hours, this fluid is drained from your abdomen in a process named 'drainage', which takes about 20-30 minutes. After that, new sterile fluid is instilled into your abdomen and the process starts all over again. This process of draining out the old fluid and instilling new fluid is called an 'exchange' and is done mainly by gravity. Except for the time spent during these exchanges - on average 30-40 minutes, 3-5 times a day - the rest of the days tour are free to do whatever need.

It was a prospective study involving patients undergoing CAPD at this center over a period of a 15 months. Peritonitis was defined according to the International Society of Peritoneal Dialysis recommendations.

The patients' exchange bags containing effluent dialysate was delivered to the microbiology laboratory for culturing on the same day that they was collected from the patients. The bags not processed immediately, was refrigerated at 4°C. From these exchange bags, 100 ml of fluid was withdrawn with a sterile needle and syringe under aseptic conditions. This fluid was centrifuged in sterile tubes at a rate of 3000 g for 15 min and supernatant was discarded, leaving 0.5 ml of deposit. In the centrifuged deposit, 10 ml of sterile distilled water was added and the mixture was shaken Vigorously for 30s. After vigorous shaking, the deposit was centrifuged at 3,000 g for 15 min and supernatant was discarded. The deposit was divided into three parts, the first part of the deposit was used for gram staining, Ziehl-Neelsen (ZN) staining, and 10% KOH mount to detect the presence of yeast cells or fungal hyphae. The second part of the deposit was used for culturing the bacteria which was done on Blood agar (BA) and MacConkey agar at a temperature of 37° for 24-48h. Culturing for fungi was done on Sabouraud-Dextrose agar with and without antibiotics at temperatures of 25°C and 37°C for 4 weeks, and culturing for mycobacteria was done on Lowenstein Jensen medium at 37°C for 8-12 weeks. The third part of the deposit was inoculated into Brain-Heart Infusion (BHI) broth and incubated at 37°C. BHI broth was observed daily for the development of turbidity. After the development of turbidity, the fluid was gram-stained and plated on appropriate media for isolation and identification of the microorganisms. BHI broths showing no growth was discarded after seven days of incubation.

RESULT

Table 1: Distribution of cases according to their sex.

Sex	Number of patients	Percentage(%)
Male	32	64%
Female	18	36%
Total	50	100%

Table 2: Patients distribution according to age

Age(inyears)	Number of patients	Percentage(%)
20-30	6	12%
31-40	13	26%
41-50	11	22%
51-60	11	22%
61-70	8	16%
>70	1	2%
Total	50	100%

Table 3: Patients distribution according to their socio-economic status.

Socio-economic status	Number of patients	Percentage(%)
Upper	0	0%
Middle	9	18%
Lower	41	82%
Total	50	100%

Table 4: Patients distribution according to their presence of sign and symptoms of peritonitis

sign and symptoms of peritonitis	Number of patients	Percentage(%)
Present	22	44%
Absent	28	56%
Total	50	100%

Table 5: Patients distribution according to duration of CAPD.

Duration of CAPD (inmonths)	Number of patients	Percentage(%)
<10	17	34%
10-20	23	46%
21-30	10	20%
Total	50	100%
Mean±SD	13.54±18.19	

Table 6: Patients distribution according to episodes of peritonitis

Episodes ofperitonitis	Number of patients	Percentage(%)
0	28	56%
1	9	18%
2	13	26%
Total	**50**	**100%**

Table 7: Result of CAPD dialysis culture (Total=35)

Diaylsate culture	Number of patients	Percentage(%)
Sterile	10	28.57%
Positive	25	71.43%
Total	**35**	**100%**

Table 8: Patients distribution according to result of smear staining of the centrifuged dialysate (Total 35)

Type of staining	Type of organisms	Number of Patients
GramStaining	Gram+vecocci	6(17.15%)
	Gram–vebacilli	3(8.57%)

KOHmount	Yeastcells	2(5.71%)
ZNstaining	Acid-fastnacillus	0(0%)

Table 9:Patients distribution according to result of type of organism isolated (total=30)

Type of organisms	Number of Patients	Percentage(%)
Grampositive	7	56.67%
Gramnegative	9	30%
Fungal	4	13.33%
MyobacterialsSpp.	0	0%

Table 10: Spectrum of micro organism isolated in culture (Total=30)

Organism	Numberofpatients	Percentage(%)
Gram positive	Staphylococcus aureus	8(26.67%)
	Coagulase negative staphylococcus(CoNS)	7(23.33%)
	Enter ococcus	2(6.67%)
Gram negative	Escherichiacoli	3(10.0%)
	Klebsiellapneumonae	2(6.67%)
	Pseudomonasspp.	2(6.67%)
	Enterobacterspp.	2(6.67%)
Fungal	Candidaspp.	3(10.0%)
	Rhizopusspp.	1(3.33%)

Table 11: Origin of microorganism isolated in culture (Total=30)

Origin of Organism	Number of patients	Percentage(%)
Skin	18	60%
Fecal	9	30%
Environmental	3	10%
Total	30	100%

DISCUSSION

The present study was carried out on 50 cases in the Department of Medicine, M.L.B. Medical College, Jhansi (U.P.) from June 2017 to Oct. 2018. In this study we studied 50 patients on CAPD for Incidence and spectrum of peritonitis.

CAPD-related peritonitis rates are estimated to be 0.24-1.66 episodes per patient's year, exceeding, in many low-income and middle-income countries, the guidelines recommendation of not more than 0.5 episodes per patients-years (Akoh JA et al[16]., 2014). In this study the peritonitis rate was 0.62 episodes per patient's year.

Peritonitis in CAPD patients could be caused by touch contamination, catheter related problems, bowel pathology, systemic bacteremia. Worldwide gram +ve peritonitis followed by gram —ve peritonitis are the leading causes of CAPD related peritonitis. Likewise in this study also observed that the main causes of peritonitis are gram +ve (56.67%) and gram —ve (30%) and a lesser percentage of other agents. In this study, the gram-positive organisms, the Staphylococcus aureus and the CoNS accounted for 15 (50%) episodes of the CAPD peritonitis. The Staphylococcus aureus was isolated in 8 (26.67%) and the CoNS in 7 (23.33%) CAPD dialysates.

In this study, the CoNS is an important pathogen in CAPD peritonitis. About one-fourth of the cases of peritonitis was observed to be caused CONS in this study. Also, there are studies which have reported that the majority of CAPD peritonitis is caused by CoNS. This may primarily be due to touch contamination or due to the formation of a biofilm.

Enterococci may cause between 2% and 6% of PD-related peritonitis episodes and their identification is a hallmark of a gastrointestinal origin of the infection. Overall, outcomes in enterococcus peritonitis are similar to those in CoNS peritonitis and are better than those of Escherichia coil peritonitis. In this study, 2 (6.67%) Enterococcus fecalis was isolated.

Advances in connectology have significantly reduced the overall incidence of peritonitis, particularly that caused by gram-positive organisms. However, the incidence of gram-negative peritonitis remains at a steady level, and therefore, it has become proportionally more important. Gram-negative organisms now account for 20-30% of all PD-related peritonitis. Moreover, gram-negative peritonitis is often more severe and associated with worse outcomes (Borras M. et al[17]., (2009).

Gram-negative organisms was responsible for 28% of the peritonitis in this study which was equally divided between microorganisms of fecal origin and environmental origin. Gram-negative peritonitis usually occurs either because of fecal origin or transmural migration of the infecting organisms. Gram-negative peritonitis episodes attributable to transmural migration of bacteria across the bowel wall are usually associated with multiple gram-negative organisms and anaerobic organisms (Prasad N. et al[7]., 2003).

In our sturdy group patients, transmural migrations was an unlikely route of peritonitis, because none of our cultures isolated multiple gram-negative and aerobic organisms. We think that poor hand-washing technique and lack of access to fresh running water for hand washing may have been responsible for contamination during peritoneal dialysis exchange procedure. Among the gram-negative organisms, Pseudomonas aeruginosa was the cause of peritonitis in 2 (6.67%) episodes of peritonitis. The origin may be the skin or a contaminated water bath used to heat the dialysis bag (Ashline Vet at el[18]., 1981). This study revealed that E. coil 3 (10%) causes more peritonitis episodes as compared to the other gram-negative organisms, which is similar to the pattern observed in other parts of the world.

In the recent years, fungal peritonitis complicating CAPD is being increasingly recognized. Recent antibiotic therapy, frequent episodes of bacterial peritonitis, and immunosuppression are the major risk factors of fungal peritonitis which accounts for 1-15% of episodes of peritonitis in various studies (Prasad KN et al[19]., 2004). The majority of these fungal peritonitis episodes are caused by Candida species. Candida albicans has historically been reported to be a more common cause than non-albicans species, but in recent reports, a shift has been observed.

The incidence of fungal peritonitis was 4 (13.33%) in the present study. There was 2 isolates Candida albicans 3 (10%) and Rhizopus spp. 1 (3.33%) and Aspergillus flavus in a total of 4 fungal isolates. The origin of fungal isolates may be from the patients' skin, environment, or from the mucous membranes (Eisenberg ES, et al[20]., 1986).

In year 2010 Kofteridis D.P. et al[21]., conducted a study to identify the epidemiological, clinical, and microbiological factors affecting the outcome of Peritoneal dialysis (PD)-associated peritonitis. The median age of patients was 68 years (range 10-92 years); 51 (62%) was males. There was 104 episodes (42%) of Gram-positive peritonitis, 46 (19%) of Gram-negative peritonitis, 13 (5%) of polymicrobial peritonitis, and 11 (4%) of fungal peritonitis. Compare with this study the median age of patients was 47.60 years (range 22-82 years); 32 (64%) was males. There was 35 episodes, 17 (56.67%) of Gram-positive peritonitis, 9 (13.33%) of Gram-negative peritonitis, and 4 (13.33%) of fungal peritonitis.

Jack Rubin et al[22], conducted a study in year 1980 on microbiologic evaluation, showed that 73% of 97 episodes was culture positive, with gram-positive organisms causing most of the cases, especially early in dialysis. Gram-negative rods tended to occur later. Gram stains of dialysate effluent resulted in a disappointingly low yield of only 9% positivity. Cellcounts was a dependable indicator of the presence of peritoneal inflammation and also of therapeutic success. In this study, that 17 (56.67%) of 35 episodes was culture positive, with gram-positive organisms causing most of the cases, especially early in dialysis. 9 (33.33%) gram-negative rods tended to occur later.

CONCLUSIONS

In this study the incidence and spectrum of CAPD (Continuous Ambulatory Peritoneal Dialysis) peritonitis, on the basis of my observation and result it is concluded that the majority of cases of peritonitis was caused by gram-positive and gram-negative microorganisms and lesser percentage by other agents. The rates of gram positive peritonitis was higher than that of gram —ve peritonitis. The higher incidence of gram +ve peritonitis in CAPD patients was due to the break in sterile techniques. The peritonitis rate was 0.62 episodes per patient's year.

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