

## Peritoneal Dialysis – Associated Peritonitis Caused By Gram-Negative Bacteria

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### Summary:

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**Background:** The number of patients renal transplant therapy has increased over the past decade. The majority of the patients with end – stage renal disease (ESRD) receive dialytic therapy as the mode of renal replacement 62.3% of all patients with ESRD are treated within center hemodialysis, whereas 8.7% receive peritoneal dialysis.

**Objective:** This study was conducted to isolate and identify the dominate Gram -negative bacteria isolates of peritoneal dialysis – associated peritonitis in the renal transplant unit at the Baghdad teaching hospital and the resistance of these locally isolates different antibiotics.

**Methods:** 50-100 ml peritoneal effluent fluid specimens were collected from these patients (which aged up to 15 years) and centrifuged and sediment cultured on the appropriate bacteriological culture plates.

**Results:** The most offender Gram – negative bacteria involved in mixed infections were *E coli* 20 (40%) followed by *Enterobacter spp.* 15(30%) and *Klebsiella spp.* 3(8.8). While the most important Gram – negative bacteria involved in single infections were *Klebsiella spp.* 8 (50%) followed by *E coli* 6(37.5%) and *Proteus spp.* 2(12.5%). All Gram – negative bacteria isolated from patients were resistant to Penicillin, Gentamicin, Tetracycline, Cefoxitin, Tobramycin and Trimethoprim-Sulphamethazol, but almost were sensitive to Amikacin, Norfloxacin, and Ciprofloxacin.

**Conclusion:** The most common species of Enterobacterales that seen in the peritoneal dialysis fluid that caused peritonitis were *E coli*, *Enterobacter spp.*, and *Klebsiella*, and their presence in the peritoneal dialysis fluid indicates fecal contamination due to bowel perforation or possible migration through the bowel wall

**Key words:** Peritonitis, Microbiology of peritoneal dialysis, Gram – negative bacteria and peritonitis.

### Introduction:

The number of renal transplant patients therapy has increased over the past decade. The majority of the patients with end – stage renal disease ( ESRD) receive dialytic therapy as the mode of renal replacement 62.3% of all patients with ESRD are treated within center hemodialysis, whereas 8.7% receive peritoneal dialysis<sup>1</sup>. Due to the improvements in connection technology, and over all progress in the management of patients, there has been marked reduction in the incidence of peritoneal dialysis- associated peritonitis<sup>(1,2,3)</sup>.

However, peritonitis remain a major complication of chronic peritoneal dialysis (PD)<sup>(4,5,6)</sup> It also a major risk factor for morbidity and mortality, catheter loss, and failure of PD.<sup>(6,7,8)</sup>

The clinical severity and consequence of about of peritonitis can vary depending on the etiology of the episodes.<sup>(2)</sup>

Although the incidence of infection by Gram – negative bacteria is significantly less than that by Gram – positive bacteria, the outcomes of a Gram – negative peritonitis are more severe in terms of hospitalization, mortality, increased rate of conversion to hemodialysis, and higher incidence of peritoneal dialysis catheter loss.<sup>(9)</sup>

### Patients and methods

The study was conducted in the renal transplant unit at Baghdad Teaching hospital, during the study period March 2005 to June 2005, the total number of admissions was 50 patients.

50-100 ml peritoneal fluid (effluent) specimens were collected from each patients, then each sample concentrated and cultured to maximize bacterial recovery rates. For immediate delivery, transport sample at room temperature, for delayed delivery (>1hour after collection) refrigerate but do not freeze sample. Processing of the samples of the samples were carried out by place up effluent fluids samples into 50 ml tubes and centrifuged for 15 min at 3000g. Decant supernatant aseptically and then vortex to resuspend sediment.

Microscopical examination was performed by doing Gram stain on sediment, culturing was made up by using Pasteur pipette, draw up sediment

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and place 1 drop on Bacteriological culture plates. Any growth was identified by colonial characteristic and standard biochemical tests.<sup>10</sup>

Antibacterial susceptibility testing was performed by the Kirby- Bauer disc diffusion method.<sup>11</sup>

### Results:

A total of 50 episodes of peritonitis were documented during the period March 2005 to June 2005, 34 (68%) cases had more than one microorganism (mixed infection) while the infection was 16( 32%) cases.

The most offender Gram – negative bacteria involved in mixed infections were *E coli* 20 (40%) followed by *Enterobacter spp.*15(30%) and *Klebsiella spp.* 3(8.8) ( Table 1).

While the most important Gram – negative bacteria involved in single infections were *Klebsiella spp.*8 (50%) followed by *E coli* 6(37.5%) and *Proteus spp.*2(12.5%) ( Table 2).

Of 50 cases, 19 cases shows relapsing peritonitis and the most important Gram - negative bacteria which caused relapsing peritonitis was *E coli* 10(64%) followed by *Enterobacter spp.* 5(20%) and *klebsiella spp.* 2 (8%) (Table 3).

The antibacterial susceptibility testing revealed the all Gram – negative bacteria isolated from patients were resistant to Penicillin, Gentamicin, Tetracycline, Cefoxitin, Tobramycin and Trimethoprim- sulphamethazol, but almost were sensitive to Amikacin, Norfloxacin, and Ciprofloxacin.

**Table 1: Types of Gram- negative bacteria involved in mixed infections**

Organisms	Total isolates (%)
<i>E coli</i>	38.2%
<i>Enterobacter</i>	23.5%
<i>Klebsiella spp.</i>	3 (8.8)
<i>Acinobacter spp.</i>	2(5.8%)
<i>Citrobacter spp.</i>	2(5.8)
<i>Proteus spp.</i>	2(5.8%)
<i>Pseudomonas auroginosa</i>	2(5.8%)
<i>Serratia spp.</i>	2(5.8%)
<b>Total</b>	<b>34(100%)</b>

**Table 2: Types of Gram negative bacteria involved in single infections**

Organisms	Total isolates (%)
<i>Klebsiella spp.</i>	8(50%)
<i>E coli</i>	6(37.5%)
<i>Proteus spp.</i>	2(12%)
<b>Total</b>	<b>16(100%)</b>

**Table 3 : types of Gram – negative bacteria isolated from relapsing peritonitis**

Organisms	Total isolates (%)
<i>E coli</i>	10(64%)
<i>Enterobacter spp.</i>	5(20%)
<i>Kelbsiella spp.</i>	2(8%)
<i>Proteus spp.</i>	1(4%)
<i>Pseudomonas aeruginosa</i>	1( 4%)
<b>Total</b>	<b>19(100%)</b>

### Discussion:

Patients with end stage renal disease, peritoneal dialysis has been shown to be a practical, safe, effective, and cost – effective alternative to chronic hemodialysis. Since(1986), peritoneal dialysis has been recognized as major form of therapy for chronic renal failures. While the application of this process continues to expand, a limiting factor is the threat of infection, i.e., peritonitis, associated with this procedure.<sup>12</sup>

The data presented in Table 1 and 2 suggests that peritonitis caused by Enterobacteriaceae members (*E coli*, *Enterobacter spp.*, and *Klebsiella spp.*) were frequently observed in our patients, frequent isolation of these organisms is in agreement with previous studies done by Troidle *et al.*, (1998)<sup>13</sup>, which confirms that the most common species of Enterobacteriaceae that seen in the peritoneal dialysis fluid were *E coli*, *Enterobacter spp.*, and *Klebsiella*. The presence of members of the Enterobacteriaceae in the peritoneal dialysis fluid most often indicates fecal contamination due to bowel perforation ( e.g., in diverticulitis) or possible migration through the bowel wall<sup>14,15</sup>. In an occasional hospitalized patients, organisms may migrate into the lumen from the skin or the patients feces. And they can cause severe illness and are associated with higher morbidity and mortality rates than Gram – positive organisms<sup>16</sup>.

Another interesting point is that detection of 2 cases of peritonitis caused by *Serratia marcesns* 2(5.8%), many other studies suggests that this happened due to adherence of the organisms to the catheter<sup>17</sup>.

*Acinobacter spp.* 2 (5.8%), and *Citrobacter spp.* 2 (5.8%) are the other agents has been observed with some frequency among the non fermenter bacteria. The origin may be the skin or contaminated water bath used to heat the dialysis bag .In most cases, the source of *Pseudomonas aeruginosa* could not be determined, but one miniepidemic a water bath used to preheat the dialyses fluid was incriminated<sup>18</sup>.

It is obvious from Table (3) there was 19 cases shows relapsing peritonitis ( which



defined as a repeat episode of peritonitis within 2 to 4 weeks of completion of antibiotic therapy for a preceding peritonitis episode with the same organism), the relapse may be caused by a tunnel infection or by the cocooning of bacteria within biofilms that form in the intraluminal portion of the catheter, the peritoneal cavity, or both<sup>1,6,19,20</sup>

All Gram – negative bacteria isolated from patients were resistant to Penicillin, Gentamicin, Tetracycline, Cefoxitin, Tobramycin and Trimethoprim- Sulphamethazol, but almost were sensitive to Amikacin, Norfloxacin, and Ciprofloxacin. This observation is similar to that of other researchers<sup>21,22,23</sup>.

### **Conclusion:**

The most common species of Enterobacteriaceae that seen in the peritoneal dialysis fluid that caused peritonitis were *E coli*, *Enterobacter spp.*, and *Klebsiella*, and their presence in the peritoneal dialysis fluid indicates fecal contamination due to bowel perforation or possible migration through the bowel wall. In an occasional hospitalized patients, organisms may migrate into the lumen from the skin or the patients feces. And they can cause severe illness and are associated with higher morbidity and mortality rates than Gram – positive organisms.

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