

Original research article

## AN INVESTIGATION OF THE ANTIBIOTIC SENSITIVITY OF PERITONEAL FLUID CULTURES IN CASES OF PERFORATIVE PERITONITIS

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**Abstract**

**Introduction:** Peritonitis is a prevalent issue encountered by General surgeons. Significant advancements in the treatment of peritonitis have occurred in recent decades, primarily through the utilisation of antibiotics and surgical interventions. The objectives of the study were to ascertain the antibiotic sensitivity and resistance pattern for routinely utilised antibiotics against the cultured microbes.

**Material and Methods:** This study was conducted using a cross-sectional design. The research was carried out at the Department of General Surgery, Deccan College of Medical Sciences, Hyderabad, Telangana, India. The study was done from October 2022 to September 2023. This study utilised a sample of 40 persons as subjects.

**Result:** A common complication of perforation of the hollow viscus is secondary peritonitis. Because patients sometimes do not arrive at the hospital until much later, the fatality rate is significant. The age groups of 31–40 years old and 20–30 years old accounted for the bulk of the perforation cases in our study. The average age at which symptoms first appear is 35.26 years. Based on our findings, the second half of the duodenum accounts for 52% of perforations, whereas the stomach accounts for 42%. Among the organisms developed, Klebsiella accounted for 46% of the cases, *E. coli* for 34%, and just 2% displayed a combination of the two. Our study focused on analysing the sensitivity patterns of organisms that were cultivated. Ceftriaxone, ciprofloxacin, and amikacin were the most commonly found organisms that demonstrated sensitivity.

**Conclusion:** The study found that the most common site of perforation is the duodenum, followed by the stomach. Peptic ulcer illness was the most common cause. The most common bacteria responsible for secondary peritonitis in these patients were Klebsiella and Escherichia coli, with mixed, proteus, and pseudomonas infections occurring very rarely. Cephalosporins, quinolones, and macrolides were the most effective antibiotics against Klebsiella and Escherichia coli, in that order of sensitivity.

**Keywords:** Antibiotic sensitivity, peritoneal fluid culture, and peritonitis

**Introduction**

One of the most common disorders that surgeons meet in emergency departments around the world, particularly in developing nations, is perforative peritonitis. This ailment is particularly prevalent in several countries <sup>[1]</sup>. Perforation can be caused by a wide variety of factors, including but not limited to simple duodenal perforation, traumatic perforation, and perforated appendix, as well as pancreatic abscess, which can complicate acute pancreatitis. Perforation peritonitis continues to be a significant contributor to morbidity and mortality, regardless of the underlying cause of the condition. The awful and lethal complication is something that the surgeons who are treating it are aware of; the complications might range from a modest wound infection to septic shock <sup>[2-4]</sup>.

There is also a very high quantity of contamination of the peritoneal cavity by some deadly pathogens such as *E. coli*, Klebsiella, Proteus, and enterococci species, which can lead to severe acute respiratory distress syndrome <sup>[5]</sup>. This is another factor that helps to make peritonitis more harmful. The current treatment for peritonitis focuses on correcting the underlying cause of the condition, administering antibiotics to the entire body, and facilitating supportive measures to prevent sudden infant respiratory distress syndrome <sup>[6]</sup>. It was discovered that when antibiotics were administered, if the therapy was aimed towards aerobes, there was a lower mortality rate and a higher number of residual abscess formations. On the other hand, when the therapy was directed towards anaerobes, there was a lower number of abscess formations but the mortality rate stayed the same <sup>[7]</sup>. As a result, the utilisation of combination therapy was regarded as the most effective treatment. In this study, a number of different organisms that are growing in the peritoneal fluid culture of patients who are presenting with perforative peritonitis were analysed. Additionally, the antibiotic sensitivity and resistance pattern of these organisms was also investigated. The purpose of this study was to determine how early and appropriate antibiotic therapy can be administered to patients who are presenting with perforative peritonitis prior to surgery. This can potentially improve the patient's outcome <sup>[8-10]</sup>.

Analysing bacteriological and its sensitivity patterns in peritoneal fluid in the case of perforative peritonitis in the context of the selected adequate empirical antibiotic therapy was the purpose of the study. An investigation was conducted with the purpose of determining the antibiotic sensitivity and resistance pattern of commonly used antibiotics to organisms that were cultivated in culture.

**Material and Methods**

This study was conducted using a cross-sectional design. The research was carried out at the Department of General Surgery, Deccan College of Medical Sciences, Hyderabad, Telangana, India. The study was done from October 2022 to September 2023. This study utilised a sample of 40 persons as subjects.

**Inclusion Criteria**

- Patient with perforated peritonitis confirmed by x-ray.
- Older than eighteen years

**Exclusion Criteria**

- Individual exhibiting primary peritonitis;
- Traumatic peritonitis

**Method**

This was followed by standard tests such as electrolyte and creatinine testing, electrocardiograms, blood sugar and urea, and serum creatinine. After the patient's vitals were stabilised and the diagnosis of perforation peritonitis was established, the patient was resuscitated with IV fluids and prepared for an emergency laparotomy. After obtaining agreement from the patient and their carers, the surgery was performed. The patient was administered intravenous fluids and antibiotics as part of their standard postoperative care following surgery. We used the Kirby-Bauer disc diffusion method with ampicillin, amikacin, ciprofloxacin, ceftriaxone, and cotrimoxazole to test the isolated organisms for antibiotic sensitivity after reviewing the culture reports of the peritoneal fluid. The sensitivity pattern of the organisms developed in the culture dictated the antibiotics that were altered.

**Result**

The age group of 31–40 years old had the highest number of perforation cases in our study, followed by 20–30 years old. The average age at which symptoms first appear is 35.26 years. Based on our findings, the second half of the duodenum accounts for 52% of perforations, whereas the stomach accounts for 42%. Among the organisms developed, Klebsiella accounted for 46% of the cases, *E. coli* for 34%, and just 2% displayed a combination of the two. Our study focused on analysing the sensitivity patterns of organisms that were cultivated.

**Table 1:** Patient Age Distribution

Sr. No.	Age	Number
1.	20 to 30 yrs	10
2.	31 to 40 yrs	15
3.	41 to 50 yrs	10
4.	>50 yrs	5

This study demonstrates that the age group most frequently observed in the data falls within the range of 31 to 40 years, with a total of 15 cases. This is followed by the age group of 20 to 30 years, which has 10 cases, and the age groups of 41 to 50 years and over 50 years, each with 10 and 5 cases respectively.

**Table 2:** Gender Distribution

Sr. No.	Gender	Number
1.	Male	35
2.	Female	5

The study's sex distribution reveals a higher incidence of perforation in males (35)

compared to females (5). This finding is similar to the majority of the related investigations.

**Table 3:** The length of time the sickness

Sr. no.	Symptoms (Days)	Cases (no)	%
1.	<1 day	02	5%
2.	2-4 days	32	80%
3.	>5 days	06	15%

The findings of our study indicate that the majority of patients sought medical attention within a period of 4 days after the onset of symptoms. 5% of the patients exhibited symptoms on the initial day, 80% displayed symptoms during a span of 2 to 4 days, and 15% of the patients presented symptoms after 5 days following the commencement of symptoms.

**Table 4:** Dispersion of the perforation location

Sr. no.	Perforation (Site)	Cases (no.)	%
1.	Gastric	15	37.5
2.	Duodenal	20	50.0
3.	Ileum and colon	5	12.5

In this study it has been found that gastric and duodenal perforations had an identical frequency, however duodenal perforation is somewhat more prevalent at 50.0%, followed by gastric perforation at 37.5%. Ileal and colonic perforations occur at a rate of 12.5%.

**Table 5:** Cultured organisms in peritoneal fluid

Sr. no.	Microorganism	Cases (no.)	%
1.	Klebsiella	20	50.0%
2.	<i>E. coli</i>	15	37.5%
3.	Proteus	1	2.5%
4.	Pseudomonas	2	5.0%
5.	Klebsiella+ <i>E. coli</i>	1	2.5%
6.	No growth	1	2.5%

Among the 40 cases sent for peritoneal fluid culture at our hospital, the results showed that 20 cases (50%) had growth of Klebsiella, 15 cases (37.5%) had growth of E Coli, 2 cases (5%) had growth of Pseudomonas, 1 case (2.5%) had growth of Proteus, 1 case

(2.5%) had mixed growth of *E. coli* and *Klebsiella*, and 4 cases had no growth. In our investigation conducted at the hospital, *Klebsiella* was the most often identified organism in the cultures, followed by *E. coli*.

### Discussion

A common complication of perforation of the hollow viscus is secondary peritonitis. Because patients sometimes do not arrive at the hospital until much later, the fatality rate is significant. The age group of 31–40 years old had the highest number of perforation cases in our study, followed by 20–30 years old. The average age at which symptoms first appear is 35.26 years. Based on our findings, the second half of the duodenum accounts for 52% of perforations, whereas the stomach accounts for 42%. Among the organisms developed, *Klebsiella* accounted for 46% of the cases, *E. coli* for 34%, and just 2% displayed a combination of the two. Our study focused on analysing the sensitivity patterns of organisms that were cultivated. Ceftriaxone, ciprofloxacin, and amikacin were the most commonly found organisms that demonstrated sensitivity [11-13].

Duodenal perforation is the most common type of perforation, followed by stomach perforation. The most prevalent organisms found in these cases are *Klebsiella* (54%), *Escherichia coli* (34%), *Pseudomonas* (4%), and *Proteus* (2%). In 24 percent of instances, meropenam is the most effective antibiotic against *E. coli* and *Klebsiella*, followed by amikacin (20 percent), ceftriaxone (18 percent), ciprofloxacin (12 percent), and amoxicillin (6 percent). In the sequence of meropenam, ceftriaxone, amikacin, ciprofloxacin, and amoxicillin, *Klebsiella* and *E. coli* are sensitive [14, 15].

Patients presenting with perforation peritonitis in our study often fell between the age range of 20 to 50 years, with a peak in the 20 to 30 years old group. Presenting at an average age of 36. The average age of presentation was 32 years lower in that study compared to ours. Most cases of perforation peritonitis can be diagnosed with a clinical evaluation and an X-ray of the abdomen; however, in a small number of cases, ultrasonography and CT scans are helpful. According to the results of this study, the colon had the lowest rate of perforation peritonitis, followed by the ileum, the stomach, the jejunum, and the appendix. Among 430 patients with gastrointestinal perforation, 210 were attributable to penetrating trauma, 92 to appendicitis, and 68 to peptic ulcers, according to a study by Noon *et al.* from Texas [16-18]. The researchers from Varanasi, Khanna *et al.*, looked at 204 consecutive cases of gastrointestinal perforation and discovered that typhoid was the cause of more than 50% of them. Additionally, they experienced perforations as a result of tuberculosis, amoebiasis, appendicitis, and duodenal ulcers [19]. These numbers, along with the high prevalence of typhoid-induced perforation, demonstrate the significance of infestation and infection in the developing world. The authors of the current study discovered that the incidence of duodenal ulcer perforation was approximately five times higher than that of gastric ulcer perforation when comparing the two. It was closer to 7:1 in other research. The majority of the patients who tested negative for growth in the culture arrived at our clinic within a day or two after experiencing their first perforation symptom, and peritoneal fluid investigation revealed monomicrobial growth in 80% of instances, polymicrobial growth in 3%, and no growth at all in 17% of cases [20-23].

*Klebsiella* was the most prevalent Gram-negative bacteria in 52% of cases, followed by

*E. coli* in 36% of cases, and a combination of the two in 5% of cases. Proteus and Pseudomonas were detected in the remaining instances [24, 25]. Over 87% of the gram-negative bacteria tested in this study were sensitive to amikacin, ciprofloxacin, and ceftriaxone, whereas ampicillin and clotrimazole showed resistance. In 76% of cases, minocycline and Linzolid were found to be microorganism sensitive. Staphylococcus aureus, which was found in around 8% of the fluid, was either susceptible to linzolid or minocycline but resistant to penicillin, erythromycin, or cephalexin [26-28]. The duodenum and stomach are the most prevalent sites of perforation, according to the data. In these patients, Klebsiella was the most common cause of secondary peritonitis, followed by *E. coli*, and less frequently, mixed flora, proteus, and pseudomonas. A study indicated that the cephalosporine group of medicines, quinolones, and macrolide antibiotics were the most effective against Klebsiella and Proteus [29-31].

### **Conclusion**

This study concludes that perforation is most frequently observed in the duodenum, followed by the stomach. The majority of the cases were attributed to peptic ulcer disease. The primary cause of secondary peritonitis in these instances was predominantly Klebsiella, followed by Escherichia coli, and occasionally by a combination of proteus and pseudomonas. Klebsiella and Escherichia bacteria exhibited susceptibility to cephalosporin antibiotics, followed by quinolones and macrolide antibiotics.

### **Funding**

None

### **Conflict of Interest**

None

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