Original Research Article

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Clinical and microbiological profile in intra-abdominal infection

Chaithanya J.*, Ashwini R. K., Rajagopalan S.

Department of Surgery, Rajarajeswari Medical College and Hospital, Bangalore, Karnataka, India

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*Correspondence: Dr. Chaithanya J.,

E-mail: drchaithanyaj@gmail.com

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ABSTRACT

Background: Intra-abdominal infections (IAIs) are different from other infections in a surgical patient. One important aspect is the microbiological analyses, especially in the era of broad spread of resistant microorganisms. The study was designed to describe the clinical and microbiological profiles of IAI.

Methods: A prospective study was conducted for a period of 1 year (December 2016 to November 2017) in Rajarajeswari Medical College and Hospital, Bangalore. Patients admitted and operated for acute abdomen/ IAI were included in this study and were analyzed.

Results: In 1 year period a total of 112 patients with IAI were assessed. A total of 5 types of micro-organisms were cultured. All the cultures were polymicrobial with aerobic organisms pre-dominantly gram negative bacilli (*E.coli*). The most common site was appendix. *E. coli* in this study showed 100.0% susceptibility to imipenem, 86% to meropenem and 77.6% to amoxi-clavulanate.

Conclusions: The most common site of IAIs was appendix (50%). E. coli (52%) is the most common organism isolated.

Keywords: Intra-abdominal infections, Empirical antibiotics, Microorganisms, Sensitivity

INTRODUCTION

Intra-abdominal infections are generally the result of invasion and multiplication of bacteria in the wall of a hollow viscus or beyond. Intra-abdominal infections (IAIs) include a wide array of pathological conditions, ranging from uncomplicated appendicitis to fecal peritonitis. ¹

IAIs are one of the most common complications following surgery, occur within the abdominal cavity, the retroperitoneum and the abdominal organs. IAIs can occur in any organ including biliary tract, liver, peritoneum, pancreas with secondary bacterial infections. Based on the pathogen, IAIs can be divided into community-acquired intraabdominal infections (CIAIs) and hospital-acquired or nosocomial intraabdominal infections (NIAIs). ¹

According to the severity, CIAIs can be divided into mild, moderate and severe.² Severe IAIs are associated with progressive multiple organ dysfunction, prolonged hospitalization, and high mortality.³ In recent years, there have been many reports on the bacterial epidemiology and treatment of IAIs.

Several reports have emphasized the role of appropriate empirical broad spectrum antibiotic therapy prior to culture sensitivity to improve clinical success rates, reduce length of stay and decrease overall cost of hospitalization in IAIs. Hence this study was designed to study the clinical and microbiological profile of intraabdominal infections.

Empirical antibiotic therapy in IAI is left to individual choice at present, a prospective microbiological analysis will provide a guideline for even empirical therapy in IAI prior to antibiotic culture and sensitivity.

The aim of this study is to identify the clinical and microbiological profile in intra-abdominal infections.

The objective of the study is to provide information for optimizing the selection of antimicrobial agents in patients with IAI.

METHODS

A prospective descriptive study was conducted for a period of 12 months (December 2016 to November 2017) in Rajarajeswari Medical College and Hospital.

Inclusion criteria

Patients admitted and operated for acute abdomen/ IAI were included in this study.

Exclusion criteria

Penetrating trauma cases were excluded from this study.

Detailed history of all patients was collected with thorough clinical examination and entered into the proforma during their stay. Patients were started on empirical antibiotics on presentation and a culture swab/pus/ fluid was taken from the peritoneal cavity during laparotomy and was sent for culture and sensitivity. Once the culture reports arrived the antibiotics were altered according to the sensitivity. The following data were collected and entered in the proforma such as patient particulars, time of onset of symptoms. Previous antibiotics in the past 7 days, general and systemic examination, biochemical and radiological investigations as required, time of onset of symptoms to commencement of surgery, organism isolated from intra-abdominal sample and antibiotic sensitivity.

RESULTS

In 12 month period of study from December 2016 to November 2017, 112 patients of IAI were included. Male to female ratio was 2.5:1. Median age was 42 year old with range of 18-74 year old (Figure 1). Intra peritoneal specimens were collected from all these patients.

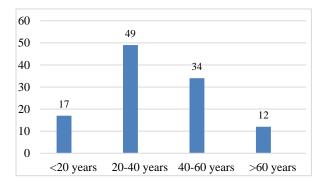


Figure 1: Age group of the patients that were included in this study.

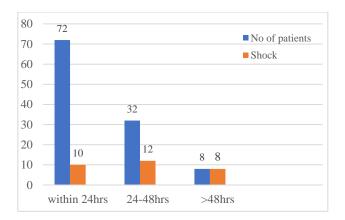


Figure 2: Status of the patient during first presentation.

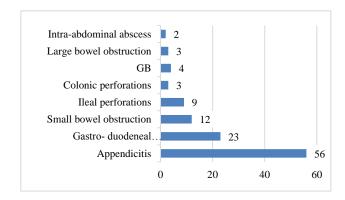


Figure 3: Site of intra-abdominal infection.

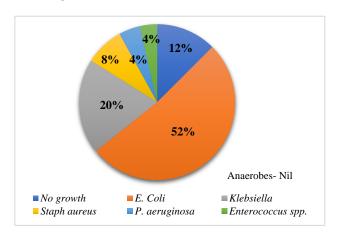


Figure 4: Organism isolated on culture sensitivity of intra-abdominal sample.

Most of the patients presented within 24 hrs from the onset of symptoms (72 of the 112 patients) and these patients who presented within 24 hrs had no signs of shock. Whereas 8 patients who had presented after 48 hrs after the onset of symptoms were in shock (100%) (Figure 2).

The most common cause of IAI infections that presented to our hospital were due to appendicitis (50%) followed

by gastro-duodenal perforation (20.53%), small bowel

obstruction (10.71), ileal perforation (8.03%) (Figure 3).

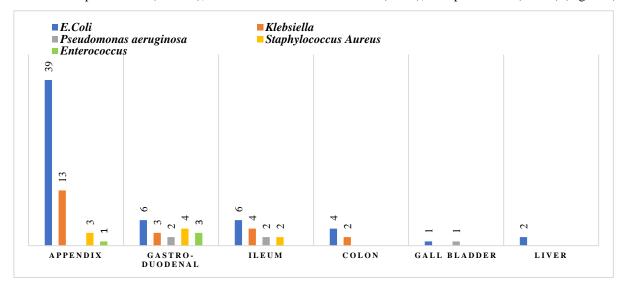


Figure 5: Isolation of organism based on site of intra-abdominal infection.

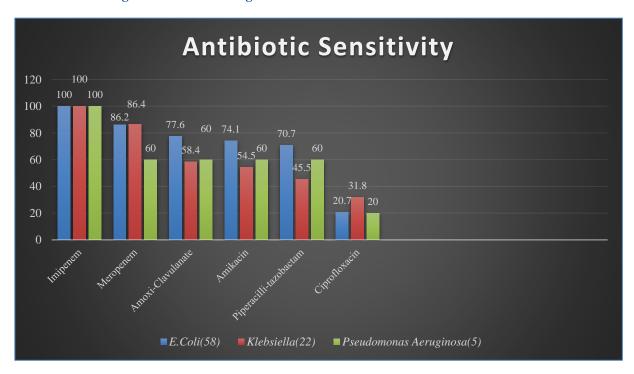


Figure 6: Antibiotic sensitivity based on the culture report of the intra-abdominal specimen.

The most common organism isolated was *E. coli* (52%) followed by *Klebsiella* (20%), *S. aureus* (8%), *Pseudomonas* and *Enterococcus* 4% each. No organism was isolated in 12% of the samples. Anaerobes were not isolated in any of the samples (Figure 4).

The most common organism isolated was *E. coli* followed by *Klebsiella* in appendix, ileal and colonic specimens whereas it was *E. coli* followed by *Staphylococcus aureus* in gastroduodenal specimens (Figure 5).

S. aureus (9) was 100% sensitive to vancomycin, 67% sensitive to gentamycin and 42% sensitive to ciprofloxacin. Enterococcus (4) was 100% sensitive to amoxicillin and Vancomycin and 53% sensitive to ciprofloxacin and 15% to gentamycin (Figure 6). A total of 5 different microorganisms were cultured. All the IAIs were polymicrobial, with aerobic microorganism predominantly Gram-negative bacilli. The most predominant microorganism was E. coli, found in 52% (58 patients) of IAIs. The most common site of intra-abdominal infection was appendix (50%).

DISCUSSION

Several epidemiological studies on microbiological profiles of IAIs at single centre or multiple centres have been published recently. 5-9 The microbiological profile of IAIs is the summary of transient or persistent normal gastrointestinal flora with potentially pathogenic microorganisms, including the gram-positive, gramnegative, anaerobic bacteria and fungal. Microbiological profile is of great importance in choosing the appropriate empirical antibiotic and adjusting the initially inappropriate antibiotic or de-escalation of antibiotics.

In our study IAIs are polymicrobial with predominantly aerobic component, In this study, 12% culture was negative. Most of the IAIs were community acquired from appendicitis. In studies of community-acquired IAIs, *E. coli* were found in more than 50% isolates. ^{5,10} *E. coli*, *Streptococcus spp.* and *Bacteroides fragilis* were the most frequently isolated microorganisms. ^{4,7,8} This study also found *E. coli* as the most frequent microorganism in IAIs (52%), followed by *Klebsiella* and *S. aureus* (20% and 8% respectively).

In our study Appendix (50%) was the most common site of infection which was the same in the studies by Montravers et al, Lugito et al and Sartelli et al. ^{1,4,11} Location of the lesions of secondary peritonitis influences

the spectrum of pathogens involved, as gastroduodenal, small intestine, appendix and colorectal have a different flora in terms of microorganism species and density. Gram-negative and anaerobic bacteria are dominant in IAIs from colorectal or appendix. Gram positive bacteria and yeasts are dominant in IAIs from gastroduodenal. There is a relative balance between the four groups of microorganisms in IAIs from small intestine. In this study the dominant microorganism was *E. coli* (52%), a gram-negative bacteria, and the most common site of infection was appendix (50%). *E. coli* was found 69.64% of IAIs originating from appendix.

In our study *E. coli* showed lowest sensitivity to piperacillin-tazobactam (70.7%) and ciprofloxacin (20.7%). In a study in Sudan, MDR *E. coli* showed high resistance to ofloxacin and ciprofloxacin (55.9% and 57.4% respectively). ¹⁴ The hypothesized causes were the inappropriate use of fluoroquinolones for humans and prolonged use of low dose of the more potent fluoroquinolones such as ciprofloxacin. ^{15,16}

E. coli in this study showed 100.0% susceptibility to imipenem 86% to meropenem and 77.6% to amoxiclavulanate. The hypothesized cause is that Imipenem is a very powerful antimicrobial used only in hospital settings and not as first-line antimicrobial.¹⁴

Table 1: Comparison of various studies with our study.

Discussion	Our study	Montravers et al.4	Lugito et al. ¹¹	Ouyang et al. ¹⁷	Shree et al. 18	Sartelli et al. ¹
Site	Appendix 50% Gastro-duodenal 20.5%	Appendix- 34%	Appendix-41%	NA	NA	Appendix 33.33% cholecystitis 14.6% Gastro- duodenal 13.3%
Micro- organism	E.coli 52% (58) Klesbsiella 20% (22)	E.coli 72% Enterococcus 19%	E.coli 58.8% S. aureus (11.8%)	E.coli 47.6% Klesbsiella 16.9%	E.coli 43.5% Klesbsiella 25.4%	E.coli 41.2% Klesbsiella 10.5%
Antibiotic sensitivity	E.coli Imipenem-100% Meropenem-86% Amoxi-clavulanate 76% Amikacin-74% Piperacillin- tarzobactam-71% Klibsiella Imipenem-100% Colistin-100% Meropenem-86% Amikacin-55% Amoxi-clavulanate-50% Piperacillin tarzobactam -53%	E.coli Imipenem-100% Amikacin-100% Amoxi-clavulanate 78% Piperacillin-97%	E.coli Imipenem-100% Meropenem- 90% Amikacin-100% Piperacillin- 100%	E.coli Imipenem, Meropenem, Amikacin, Piperacillin- (sensitivity >95%). Klibsiella Imipenem, Amikacin and Piperacillin were the most active agents against Klebsilla (sensitivity >95%).	E.coli Imipenem- 100% Colistin-100% Meropenem- 85.1% Amikacin- 74.5% Piperacillin- 72.3% Klibsiella Imipenem- 100% Colistin-100% Meropenem- 85.2% Amikacin- 59.3% Piperacillin- 53%	NA

CONCLUSION

This study concluded that most common source of IAIs was appendix (50%) and next common source was the gastro-duodenal perforations (20.5%). *E. coli* was the most common organism isolated, which was most sensitive to imipenem, meropenem, amoxi-clavulanate, amikacin and piperacillin-tazobactam. The next common organism was *Klebsiella* which was sensitive to imipenem, meropenem, amikacin and amoxi- clavulanate. Clinical profile did not vary with regards to the organism isolated.

E. coli is most sensitive to imipenem and meropenem in most of the studies followed by amikacin and amoxiclavulanate. Amoxi-clavulanate can be used as the first line drug in our country as E. coli is sensitive to amoxiclavulanate and no higher antibiotic is necessary as an empirical antibiotic due to cost factors.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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