Aerobic Bacterial Causes of Secondary Peritonitis and Their Antibiotic Sensitivity Patterns among HIV Negative Patients with Non-traumatic Small Bowel Perforations in Mbarara Regional Referral Hospital

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Back ground: ***Intra-abdominal infections are commonly encountered in surgical practice and represent a major cause of morbidity and mortality. The most common aetiology is contamination of the peritoneal space by endogenous micro-flora among patients with gastro intestinal perforations. Inappropriate antibiotic therapy of secondary peritonitis may result in poor patient outcomes. The selection of an appropriate empirical antibiotic agent can be challenging amidst limited laboratory infrastructure and the emerging resistance to commonly prescribed antibiotics. This study was aimed at determining the aerobic bacterial causes of secondary peritonitis and their antibiotic sensitivity patterns among HIV negative patients with non-traumatic small bowel perforations in Mbarara Regional Referral Hospital so as to guide initial empirical treatment.***
Methods: ***This was a cross-sectional study in which 87 consenting patients with non-traumatic small bowel perforation confirmed at laparotomy, on the emergency ward of Mbarara Regional Referral Hospital were enrolled consecutively from September 2011 to May 2012. HIV testing and peritoneal fluid analysis was done for all patients enrolled into the study.***
Results: ***Majority of patients had either Klebsiella spp (37.9%) or Escherichia coli (26.4%) on peritoneal fluid culture, while 12 (13.8%) had no growth at all. Four patients (4.6%) had more than one organism cultured. Most of the organisms were susceptible to Ceftriaxone followed by Ciprofloxacin and Gentamycin. Peritoneal fluid gram stain showed gram negative bacilli in 79.3% of the cases while peritoneal fluid ZN stain did not demonstrate any AAFBs. All patients tested HIV negative.***
Conclusions: ***The results indicated that secondary peritonitis among HIV negative patients with non-traumatic small bowel perforation at MRRH was mainly due to Klebsiella spp and E. coli which were mainly sensitive to cephalosporins, quinolones and aminoglycosides.***

Key words: Aerobic, Bacteria, Secondary, Peritonitis. Antibiotic. Sensitivity, HIV negative, Bowel, Perforation

Introduction

Intra-abdominal infections are commonly encountered in surgical practice and represent a major cause of morbidity and mortality. The most common aetiology is contamination of the peritoneal space by endogenous micro-flora secondary to loss of integrity of the gastrointestinal tract which results in secondary peritonitis[1.] This is often acute and results in rapid, progressive and systemic illness with subsequent morbidity and mortality.

Inappropriate antibiotic therapy of secondary peritonitis may result in poor patient outcomes. The selection of an appropriate agent can be challenging because of the emerging resistance of target organisms to commonly prescribed antibiotics.[2] Knowledge about the microbial flora responsible for secondary peritonitis in these patients is of paramount importance in choosing their antimicrobial regimen.

Methods

This was a cross-sectional study, in which consecutive enrolment of HIV negative patients with peritonitis secondary to non-traumatic small bowel perforation, confirmed at laparotomy, was done on emergency ward in Mbarara Regional Referral Hospital from September, 2011 to May, 2012. The study was approved by the Institutional Review Board of Mbarara University of Science and Technology.

The demographic characteristics of patients enrolled into the study were entered in a pre-tested data collection form. Peritoneal fluid (5ml) was obtained from patients with confirmed non-traumatic small bowel perforations at laparotomy and was cultured aerobically on MacConkey agar, Blood agar and Chocolate agar. Isolated organisms were tested for antimicrobial susceptibility by Kirby-Bauer disc diffusion method using Ceftriaxone, Ciprofloxacin, Chloramphenicol, Nalidixic acid, Gentamycin, Tetracycline, Septrin, Amoxicillin, Ampicillin and Penicillin-G discs. Peritoneal fluid gram stain and ZN stain were also performed. Test results were reviewed by two independent senior laboratory technicians for internal quality control. Data was entered in Ms Excel and analysed using STATA 11.

Results

A total of 87 patients with peritonitis secondary to small bowel perforation were enrolled into the study. They were from the rural areas of greater Mbarara. Their mean duration of symptoms was 13 days and most of the perforations were in the terminal ileum (see table1). *Klebsiella spp* and *E. coli* were the major peritoneal fluid isolates (see table2). Four patients had more than one peritoneal fluid isolate. Most of the organisms were sensitive to Ceftriaxone followed by Ciprofloxacin and Gentamycin (see figures 1, 2 and 3).

Table 1. Baseline patient characteristics

Characteristic		**Mean (sd*) or Median (IQR**) or n(%)**
Sex		
	Male	63 (72.4%)
	Female	24 (27.6%)
Age (years)		14 (10-25)
Referral		
	Yes	74 (85.1%)
	No	13 (14.9%)
District of residence		
	Greater Mbarara	49 (56.3%)
	Greater Bushenyi	10 (11.5%)
	Others	28 (32.2%)
Occupation		
	Unemployed	55 (63.2%)
	Unskilled labourer	02 (2.3%)
	Subsistence farmer	29 (33.3%)
	Professional	01 (1.2%)
Duration of symptoms (days)		13.2 (6.2)
Number of perforations		
	1	50 (57.5%)
	2	25 (28.7%)
	3	06 (6.9%)
	4	02 (2.3%)
	5	01 (1.2%)
	6	03 (3.5%)
Length of perforation from ICJ* (cm)**		14.8 (9.7)
Negative HIV status		87 (100%)

sd = standard deviation, **IQR = Interquartile range, ***ICJ = ileocaecal junction

Table 2 – Peritoneal fluid analysis (n = 87)

Test		Frequency (percentage)
ZN stain	No AAFBs seen	87 (100)
Gram stain		
	G +ve cocci	06 (6.9)
	G -ve bacilli	69 (79.3)
	Both G +ve cocci and G -ve bacilli	07 (8.1)
	Nil	05 (5.8)
Culture		
	Klebsiella spp	33 (37.9)
	Escherichia coli	23 (26.4)
	No growth	12 (13.8)
	Pseudomonas spp	04 (4.6)
	Streptococcus spp	03 (3.5)
	Staphylococcus aureus	02 (3.3)
	Aerobacter spp	02 (2.3)
	Proteus mirabilis	01 (1.2)
	Enterobacter spp	01 (1.2)
	Salmonella typhi	01 (1.2)
	Pseudomonas + Klebsiella	01 (1.2)
	Klebsiella + Proteus	01 (1.2)
	Klebsiella + E. Coli	01 (1.2)
	Klebsiella + Staph. Aureus	01 (1.2)
	unidentified coliform	01 (1.2)

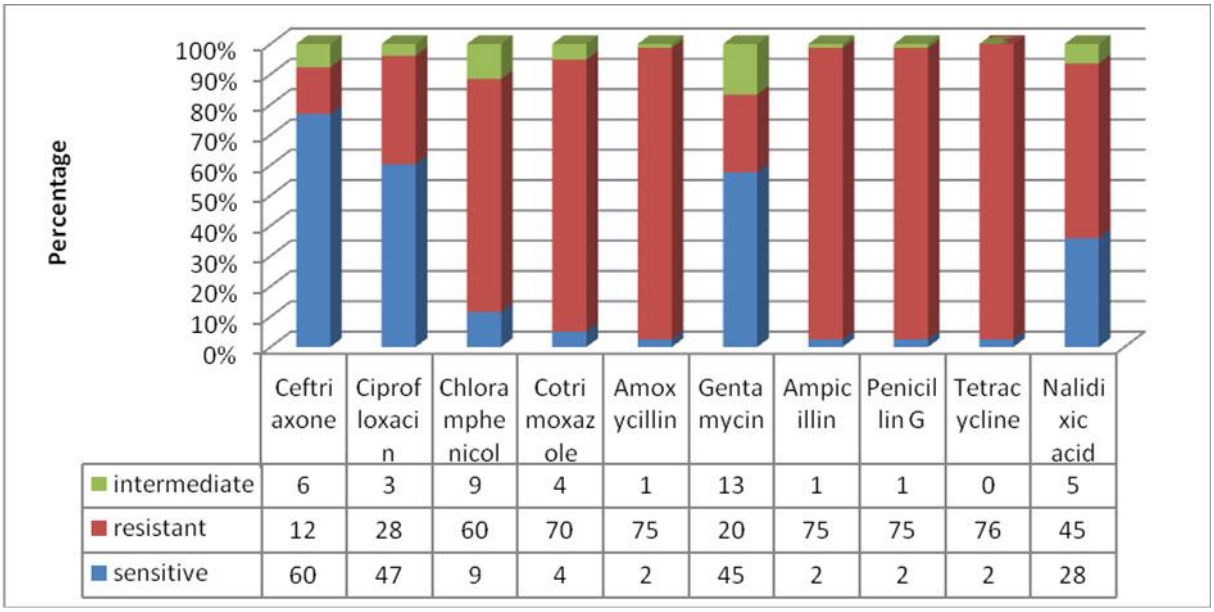

Figure 1. Overall sensitivity patterns of peritoneal fluid culture isolates (n=78)

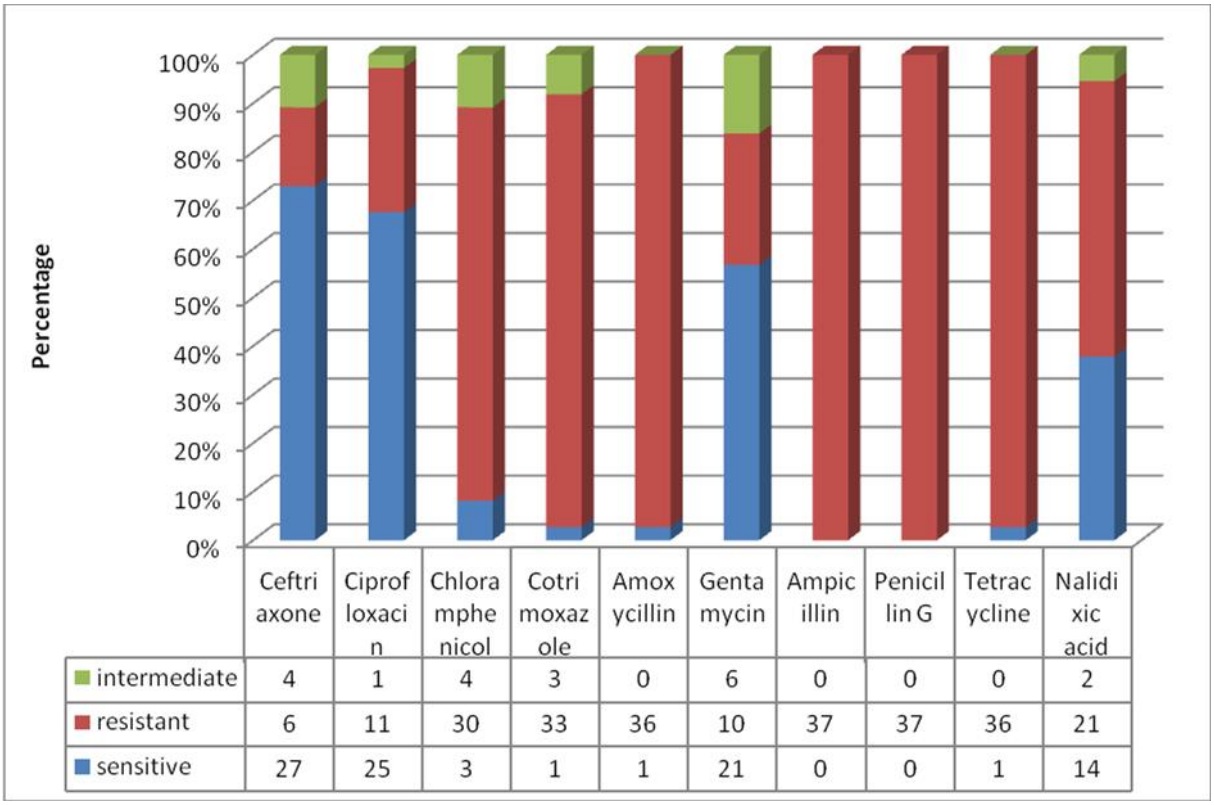

Figure 2: Sensitivity patterns of *Klebsiella spp* obtained from peritoneal fluid cultures (n=37**)**

*****Includes the 4 cases of Klebsiella spp among those with more than one peritoneal fluid isolate*

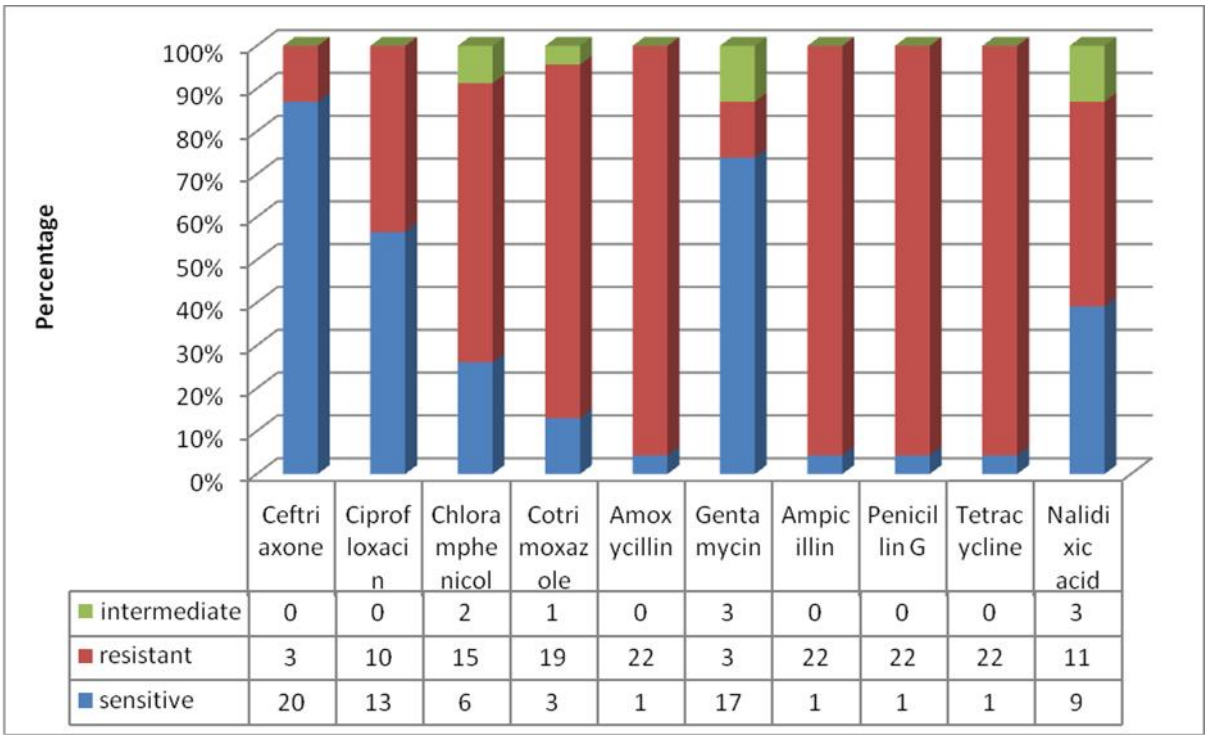

Figure 3: Sensitivity patterns of *E. coli* obtained from peritoneal fluid cultures (n=23)

Discussion

Peritonitis secondary to small bowel perforation was more common among males than females with a median age of 14 years. Majority of patients were from the rural areas of greater Mbarara with a low socio-economic class, poor hygiene and environmental sanitation in their homes and schools as well as poor health seeking behaviour. All the patients were HIV negative with no other pre-existing comorbidities or exposures to long-term medications like steroids.

Majority of small bowel perforations in developing countries are due to typhoid fever.[3, 10, 11, 12, 13] However, regardless of the cause of the perforation, secondary peritonitis arising from these perforations greatly determines the patients' presentation and treatment outcome. Knowledge about the microbial flora responsible for secondary peritonitis in these patients is of paramount importance in choosing their antimicrobial regimen.

Escherichia coli and *Klebsiella spp* were the main isolates obtained from peritoneal fluid analysis and this was consistent with other studies relating to the microbial flora in secondary peritonitis among patients with gastrointestinal perforations.[4, 5, 6] Peritoneal fluid ZN stain did not demonstrate any AAFBs. However, the sensitivity of peritoneal fluid ZN stain among patients with tuberculous peritonitis is very low - only 2.93%.[7]

Metronidazole has been used successfully in the treatment of anaerobic infections for over 45 years. Rates of resistance to Metronidazole are still generally low.[8] However, aerobic bacterial resistance to several antibiotics is on the rise and this has made the choice of empirical treatment quite difficult and expensive. Decisions regarding empiric therapy should consider local epidemiology. Continuous research on the aerobic bacteria involved in secondary peritonitis and their susceptibility to available antimicrobial therapy is necessary. Majority of the peritoneal fluid isolates showed good antibiotic sensitivity to Ceftriaxone followed by Ciprofloxacin and Gentamycin but resistance was observed with Chloramphenicol, Ampicillin, Amoxycillin, Cotrimoxazole, Penicillin G, and Tetracycline. A pharmacodynamic analysis of different antibiotics in the empiric therapy of secondary peritonitis also revealed similar results.[9]

Conclusion

The results indicated that Secondary peritonitis among HIV negative patients with non-traumatic small bowel perforation at MRRH was mainly due to *Klebsiella spp* and *E. coli* which were mainly sensitive to cephalosporins, quinolones and aminoglycosides.

Recommendation

Peritoneal fluid cultures should be done in patients with secondary peritonitis in order to guide in the choice of antimicrobial therapy and further studies are necessary to establish the sensitivity patterns of anaerobic culture isolates as well.

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