

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.904.324>

## Antibiotic policy of Gastroenterology Surgery Center in Egypt

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### ABSTRACT

Antimicrobial resistance is considered a major health threat for patients and healthcare providers. It challenges the control of infectious diseases, jeopardizes any medical progress and imposes huge treatment costs. This study aimed to design an effective antibiotic policy for treatment of different types of infections at Gastrointestinal Surgical Center, Mansoura, Egypt in order to reduce antibiotic resistance, and to minimize unnecessary costs. From 1/1/2019 to 31/12/2019, samples were obtained according to the site of infection, cultured on suitable media. Automated identification of isolates was performed by Vitek 2 system whereas antibiotic susceptibility testing was done by disc diffusion method. Isolates with multidrug resistance were also assessed for susceptibility by Vitek 2 system. Out of 3300 microbiologic samples, 1190 (36.1%) were positive. 862 of 1190 (72.4%) were gram-negative & 328 of 1190 (27.6%) gram-positive. The patterns of resistance observed were MRSA (37.1%), ESBL (8.5%) and Carbapenemases (8.9%). An antibiogram was designed for each infection type including the first-line therapy protocol. Antibiotic initiation or change should be done after sending appropriate cultures. Once culture reports are available, the physician must step down to the narrowest spectrum antibiotic, the most efficient and cost-effective option.

#### Keywords

Carbapenemase,  
Drug resistance,  
Sensitivity tests,  
Drug resistance,  
Infection control

#### Article Info

Accepted:  
22 March 2020  
Available Online:  
10 April 2020

### Introduction

Antimicrobial resistance is considered a major health threat for patients and healthcare providers. It challenges the control of infectious diseases, jeopardizes any medical progress and imposes huge treatment costs. In the European Union, about 25000 patients die

each year from infections caused by multidrug-resistant bacteria and the estimated costs are about 1.5 billion euros per year(1).

The rapid emergence of resistant bacteria is occurring worldwide, endangering the efficacy of antibiotics, which have transformed medicine and saved millions of

lives. Resistance has emerged even to newer, more potent antimicrobial agents such as carbapenems which can be attributed to the misuse or overuse of antibiotics. Hence the importance of inclusion of the antibiotic policy in the infection control program (2-5).

The antibiotic policy is the set of written guidance that is to assist and support clinicians with decisions regarding the optimal selection, dose and duration of an antimicrobial agent for the treatment of an infectious disease in the hospital. It covers empirical treatment, specific treatment, and also agents for prophylaxis (6, 7).

The basic principles are to be direct evidence-based medicine and using local antibiogram. An antibiotic policy is now more necessary than ever for clinical, epidemiological and economic reasons(7).

The Infection Prevention and Control Committee acts as an advisory body to the medical staff, analyzing the epidemiology of the infections, improving the appropriate use of antimicrobials and provide adequate training for healthcare workers(8).

The agreement of hundreds of professionals on indications, dosage and duration of antibiotic treatment, based on the best scientific evidence and local guides is complex, but it can be done. The key to this is that the Infection Committee develops antimicrobial policy through a multidisciplinary team and professional leadership, and has the institutional support to ensure that the proper use of antimicrobials (8).

This study aimed to design an effective antibiotic policy for treatment of different types of infections at Gastrointestinal Surgical Center, Mansoura, Egypt to reduce antibiotic resistance, and to minimize unnecessary costs.

## **Materials and Methods**

This study included 3300 different samples from patients admitted to Gastrointestinal Surgery Center (GISC), Mansoura University, Egypt in the period from 1/1/2019 to 31/12/2019, with different signs and symptoms of infections. We classified GISC into 5 areas (according to the patients' distribution) including:

Liver transplantation unit on the 7th floor  
Patient admission wards on the 5<sup>th</sup> & 6<sup>th</sup> floors  
Transplantation ICU on the 2nd floor  
Surgical ICU on the 2nd floor  
Outpatient clinics on the ground floor

Microbiological samples were collected according to the site of infection. Different sample types included blood, urine, sputum, wound swab, drain aspirate, peritoneal fluid aspirate, and throat swab.

Cultures on the suitable media were done in the microbiology laboratory. Culture media used included blood agar, MacConkey agar, SS agar. All cultures were carried out by significant colony count.

Automated identification of isolates was performed by Vitek 2 system whereas antibiotic susceptibility testing was done by disc diffusion method followed CLSI – 2012 guidelines. Isolates with multidrug resistance were also assessed for susceptibility by Vitek 2 system (9). Anaerobic culture is not a routine work in our laboratory and performed only by request, therefore the results were excluded.

## **Results and Discussion**

Out of 3300 microbiologic samples, 1190 (36.1%) were positive. 862 of 1190(72.4%) were gram negative & 328 of 1190 (27.6%) gram-positive. The distribution of different samples obtained in GISC illustrated in Table

1. Most of the cultures were isolated from surgical drains (47.4%), urine (17.18%) and sputum (14.7%).

Table 2 presents the frequency of aerobic bacterial growth in each hospital ward; the majority was obtained from surgical wards (33.8%) followed by Surgical ICU (25.3%) and Outpatient Clinic (15.5%).

In Table 3, the majority of gram-negative bacteria were obtained from surgical drains (60.6%) while the majority of gram-positive bacteria were obtained from Sputum (26.8%).

The gram-negative bacteria obtained in our study were classified according to the infected site, as illustrated in Table 4.

The patterns of resistance observed were

MRSA (37.1%), ESBL (8.5%) and Carbapenemases (8.9%) (Table 5).

The antibiogram obtained for each infection type is presented in Tables 6-9, whereas the first line therapy protocol is illustrated in Table 10.

**The following antibiotics were reserved for use in resistant cases**

Linezolid (Oxazolidinone).

Carbapenems (recently introduced types).

Moxifloxacin (4<sup>th</sup> generation fluoroquinolone).

Tigecycline (Glycylcyclines).

**Table.1** Frequency of different samples in GISC

	Total prevalence in all samples					
	Total cultured		Growth		No growth	
	N	%	N	%	N	%
<b>Blood</b>	317	9.6	105	8.8	212	10.0
<b>Urine</b>	586	17.8	205	17.2	381	18.1
<b>Sputum</b>	485	14.7	187	15.7	298	14.1
<b>Wound</b>	237	7.2	79	6.6	158	7.5
<b>Drain</b>	1565	47.4	578	48.6	987	46.8
<b>Peritoneal</b>	27	0.8	9	0.8	18	0.9
<b>Throat</b>	83	2.5	27	2.3	56	2.7
<b>Total</b>	3300	100	1190	100	2110	100.0

**Table.2** Frequency of aerobic bacterial growth in each ward in GISC

		Gram negative		Gram positive		Total
		N	%	N	%	
<b>O.C</b>		134	15.5	53	16.2	187
<b>Wards</b>	<b>Floors</b>	291	33.8	114	34.8	405
	<b>ICU-Surgical</b>	218	25.3	79	24.1	297
<b>Transplantation</b>	<b>Transplantation</b>	108	12.5	43	13.1	151
	<b>ICU-Transplant</b>	111	12.9	39	11.9	150
<b>Total</b>		862	100	328	100	1190

**Table.3** Distribution of microorganisms in each sample type in GISC

	Gram negative		Gram positive		Total
	N	%	N	%	
<b>Blood</b>	54	6.3	51	15.5	105
<b>Urine</b>	127	14.7	78	23.8	205
<b>Sputum</b>	99	11.5	88	26.8	187
<b>Wound</b>	42	4.9	37	11.3	79
<b>Drain</b>	522	60.6	56	17.1	578
<b>Peritoneal</b>	9	1.0	0	0	9
<b>Throat</b>	9	1.0	18	5.5	27
<b>Total</b>	862	100	328	100	1190

**Table.4** Frequency of aerobic bacterial growth in each ward in GISC

		Gram negative		Gram positive		Total
		N	%	N	%	
<b>O.C</b>		134	15.5	53	16.2	187
<b>Surgical wards</b>	<b>Floors</b>	291	33.8	114	34.8	405
	<b>ICU</b>	218	25.3	79	24.1	297
<b>Transplantation</b>	<b>Transplantation</b>	108	12.5	43	13.1	151
	<b>ICU</b>	111	12.9	39	11.9	150
<b>Total</b>		862	100	328	100	1190

**Table.5** Patterns of resistance

	N	%	
<b>MRSA</b>	65/175	37.1	Out of Staph aureus
<b>ESBL</b>	73/862	8.5	Out of gram negative bacteria
<b>Carbapenem resistance</b>	106/1190	8.9	Out of all culture growths

**Table.6** Blood stream infection-antibiogram

Most common pathogens	Prevalence (%)	Antibiotic Sensitivity (%)
<b>Staph aureus</b>	33.3	Ampicillin/Sulbactam 66.7%, Piperacillin/Tazobactam 66.7%, Ampicillin 33.3%
<b>E.coli</b>	22.2	Ciprofloxacin 100%, Cefoxitin 100%, Cefepime 50%
<b>Citrobacter</b>	11.1	Gentamycin 100%, Ampicillin/Sulbactam 100%, Amikacin 100%, Imipenem 100%,
<b>Serratia</b>	22.2	Doxycycline 100%, Imipenem 100%,
<b>Other Gram -ve bacilli</b>	11.1	Levofloxacin 100%, Doxycycline 100%, Imipenem 100%, Piperacillin/Tazobactam 100%

**Table.7** Urinary tract infection–antibiogram

Most common pathogens	Prevalence (%)	Antibiotic Sensitivity (%)
<b>Coagulase -ve staph</b>	10.5	Levofloxacin 50%, Clindamycin 50%, Doxycycline 50%, Amikacin 50%
<b>Staph aureus</b>	5.3	Nitrofurantoin 100 % Imipenem 100%. Levofloxacin 50%, Clindamycin 50%, Doxycycline 50%,
<b>E coli</b>	21.1	Ampicillin 25%, Gentamicin 25%, Amikacin 25%, Piperacillin/Tazobactam25%,
<b>Klebsiella</b>	10.5	Cefoxitin 50%, Gentamycin 50%, Ciprofloxacin 50%, Levofloxacin 50%, Ceftazidime 50%, Cefepime 50%, Cefoperazone/Sulbactam 50%, Piperacillin/Tazobactam50%,
<b>Citrobacter</b>	5.3	Amikacin 100%, Imipenem 100%, Cefoperazone/Sulbactam 50%, Piperacillin/Tazobactam50%, Gentamicin 50%, Ciprofloxacin 50%,
<b>Proteus</b>	5.3	Ceftriaxone 100%, Gentamycin 100%, Ciprofloxacin 100%, Ceftazidime 100%
<b>Salmonella</b>	5.3	Levofloxacin 100%, Piperacillin/Tazobactam100%, Imipenem 100%, Cefoperazone/Sulbactam 100%,

**Table.8** Sputum culture – antibiogram

Most common pathogens	Prevalence (%)	Antibiotic Sensitivity (%)
<b>Coagulase -ve staph</b>	18.8	Cefoperazone/Sulbactam 100%, Piperacillin 100%, Ampicillin/Sulbactam 66.7%, Doxycycline 66.7%, Levofloxacin 33.3%, Erythromycin 33.3%, Cefoxitin 33.3%,
<i>Staphylococcus aureus</i>	12.5	Erythromycin 100%, Ampicillin/Sulbactam 50%, Doxycycline 50%, Piperacillin/Tazobactam 50%
<i>E. coli</i>	6.3	Amikacin 100%, Piperacillin/Tazobactam 100%, Cefoperazone/Sulbactam 100%, Doxycycline 100%, Cefoxitin 100%
<i>Klebsiella</i>	25.0	Piperacillin/Tazobactam 50%, Ciprofloxacin 25%, Clindamycin 25%,
<i>Citrobacter</i>	12.5	Piperacillin/Tazobactam 100%, Ciprofloxacin 50%, Erythromycin 50%,
<i>Serratia</i>	6.3	Ampicillin/Sulbactam 100%, Piperacillin/Tazobactam 100%, Ceftriaxone 100%, Ciprofloxacin 100%,
<i>Salmonella</i>	18.8	Imipenem 33.3%, Cefoperazone 33.3%

**Table.9** Wound culture – antibiogram

Most common pathogens	Prevalence (%)	Antibiotic Sensitivity (%)
<i>Staphylococcus aureus</i>	28.6	Piperacillin/Tazobactam 100%, Ciprofloxacin 50%, Erythromycin 50%, Vancomycin 100%, Piperacillin 50 %
<i>Pseudomonas</i>	42.9	Doxycycline 100%, Gentamicin 33.3%, Imipenem 33.3%, Cefoperazone/Sulbactam 33.3%, Clindamycin 33.3%,
<i>Serratia</i>	14.3	Imipenem 100%, Cefoperazone/Sulbactam 100%, Doxycycline 100%
<b>Other Gram -ve bacilli</b>	14.3	Imipenem 100%, Doxycycline 100%, Cefoperazone/Sulbactam 50%, Clindamycin 50 %

**Table.10** First line therapy protocol at GISC

<b>Blood stream infection</b>	Ampicillin/Sulbactam, Imipenem, Piperacillin/Tazobactam, Ciprofloxacin, Ceftazidime
<b>Respiratory Tract Infection</b>	Ampicillin/Sulbactam, Cefoxitin, Piperacillin/Tazobactam
<b>Wound Infection</b>	Piperacillin/Tazobactam, Imipenem, Erythromycin, Clindamycin
<b>Urinary Tract Infections (UTI)</b>	Levofloxacin, Doxycycline, Clindamycin

Antibiotic resistance may occur even with the proper use of antibiotics, widespread and inappropriate use of antibiotics makes the situation even worse. In more developed countries, there are a number of contributing factors, such as over-the-counter antibiotics, poor patient compliance, and inappropriate selection of antibiotics and overprescribing.

The present study was limited by its retrospective design, important clinical conditions, previous administration of antibiotics and their duration and dosage were not available for analysis. Nonetheless, the strength of this study can be explained by its local nature, which reflects the magnitude of the problem of bacterial resistance in a single center in Egypt.

To our knowledge, this report is the first to instruct an antibiotic policy in single center in Egypt which may have important findings for practicing physicians and authorities involved in hospital formulary in the region regarding empirical antibiotic selection and utilization.

Conclusions are as follows:

- Antibiotic initiation must be done after sending appropriate cultures
- Choosing antibiotic therapy should follow the hospital policy whenever possible. If alternatives are chosen, the clinician must document the reason in the case

records.

The need for antimicrobial therapy should be reviewed on a daily basis. For most infections, 5 – 7 days of antimicrobial therapy is sufficient.

All IV antibiotics may only be given for 48 – 72 hours, then switch to oral antibiotic(s) or switch to an IV narrow spectrum alternative.

Once culture reports are available, the physician shall step down to the narrowest spectrum antibiotic, the most efficient and most cost-effective option.

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**How to cite this article:**

Noha El-Mashad, Eman Elsayed, Mohamed Elshobary, Yomna Ahmed Setate and Mohammed Elshaer. 2020. Antibiotic policy of Gastroenterology Surgery Center in Egypt. *Int.J.Curr.Microbiol.App.Sci.* 9(04): 2748-2755. doi: <https://doi.org/10.20546/ijcmas.2020.904.324>