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Antibiotic susceptibility patterns of some clinical isolates from Al-Rass General Hospital

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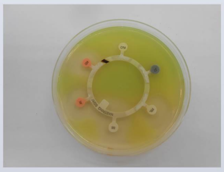
Abstract

In this investigation, 98 clinical isolates of 10 different bacterial pathogens were tested for antibiotics susceptibility. The sources of these isolates were urine, blood, sputum and wound swaps collected from patients from Al-Rass General Hospital, Saudi Arabia. Bacterial isolates were identified and tested for susceptibility with disk diffusion method as recommended by Clinical and Laboratory Standards Institute (CLSI). The results have shown that, of the 98 bacterial isolates representing 9 different bacterial pathogens, 71(72.4 %) were Gram negatives and 27 (27.6 %) were Gram positives. 21 different antibiotic disks were used. The majority of these isolates were resistant to most antibiotics tested. Accordingly, almost all isolates were defined as multidrug resistant (MDR). Acinetobacter baumanii and Enterococcus faecalis are among the most resistant MDR which poses a serious concern. There is a need for continuous monitoring of the susceptibility of pathogens to antibiotics prescribed in hospitals.

Objectives

The aim of the present study was to evaluate the antibiotic resistant patterns of the pathogenic bacteria.



Materials and methods

Sample collection

A total of 98 Samples received to the Department of Pathology and Laboratory medicine from consecutive patients from Al-Rass General Hospital, between the period from December 2014 to March 2015 were investigated. Many clinical specimens come to the laboratory from numerous sources. We choose the most five frequent sources which were wound swab, blood, urine, pus and sputum.

Antibiotics used

21 standard commercial antibiotic discs were tested against gram positive and gram negative isolates. Discs used against gram positive bacteria were as follows: Gentamicin (10 mcg), Augmentin (30 mcg), Ceftriaxone (30 mcg), Ciprofloxacin (5 mcg), Cotrimoxazole (25 mcg), Tetracycline (10mcg), Azithromycin (15 mcg), Clindamycin (2 mcg), Oxacillin (1 mcg), Penicillin G (10 units), Rifampicin (5mcg), Vancomycin (30mcg), Norfloxacin (10 mcg) and Nitrofurntoin (300 mcg). Discs used against gram negative bacteria were as follows: Ampicillin (10 mcg), Gentamicin (10 mcg), Amikacin (30 mcg), Augmentin (30 mcg), Cephalothin (30 mcg), Ceftriaxone (30 mcg), Ciprofloxacin (5 mcg), Piperacillin (100 mcg), Imipenem (10 mcg), Ceftizoxime (30 mcg), Meropenem (10 mcg), Cotrimoxazole (25 mcg), Tetracycline (10 mcg) and Azithromycin (15 mcg).

Isolation and identification

The experiments was carried out at the Department of Pathology and Laboratory medicine Al-Rass General Hospital, it is located in Qassim province, Saudi Arabia. Samples were collected from patients and transferred directly to the laboratory, cultured and incubated overnight. Bacterial strains were identified by different microbiological and biochemical tests following standard microbiological techniques, including Gram stain, Motility, Catalase, Coagulase, Indole, Growth in EMB Agar, MA, MR, VP, Glucose, Sucrose, Lactase, Maltase, Galactase, and API 20 E (Bio Merie ux, France).

Antibiotic susceptibility testing

The antibiotic susceptibility test was performed by Kirby–Bauer disk diffusion method as set by Clinical and Laboratory Standards Institute (CLSI, 2012). Briefly, overnight culture from each isolate adjusted to be equivalent to 0.5 McFarland seeded in sterile plates containing Mueller Hinton agar (Oxoid). Then, standard antibiotic disks were aseptically loaded in to seeded plates. Plates were then incubated for 18h at 37 o C. The diameter of inhibition zones around the antibiotic discs were measured and interpreted as sensitive/resistant according to CLSI guidelines (CLSI, 2012).The data obtained were tabulated and analyzed. Multidrug resistance (MDR) was defined as resistant to at least three tested antibiotics (Oteo et al., 2005)

Results

As shown in Table 1, the incidence of bacterial isolates among 98 specimens examined were 62.2% urine, 14.3% wound swab, 11.2% Blood, 7.1% sputum and 5.1% pus. Urine specimens were the most frequent. The results of the hospital specimens revealed Gram negative bacteria are much resistant to antibiotics than gram positives (Table 2 and 3). It is know that Gram negative bacteria are more resistant to antibiotics than gram positive. The resistance rates of Gram positive isolates are shown in Table 2. The resistance rates of Gram negative isolates are shown in Table 3. Table 4 showing the most resistant bacterial isolates to certain antibiotics, where resistance incidences was 50% or more, almost all of them were MDR except Staphylococcus epidermidies. In particular, serious attention should be directed to Acinetobacter baumanii and Enterococcus faecalis which were the highest multi-drug resistant strains.

Table 1.Incidence of bacterial isolates from the hospital (From December 2014 to March 2015).

Clinical specimens	No. of isolates (Percent)	Gram positive bacteria				Gram negative bacteria				
		Staphylococcus aureus	*Staphylococcus epidermidis*	*Staphylococcus Saprophyticus*	*Enterococcus faecalis*	*Escherichia coli*	*Proteus mirabilis*	*Klebsiella pneumoniae*	*Pseudomonas aeruginosa*	*Acinetobacter baumanii*
Urine	61 (62.2%)	2	1	7	9	13	6	12	8	3
Wound swab	14 (14.3%)	5	–	–	–	1	1	–	4	3
Blood	11(11.2 %)	–	–	–	1	3	4	1	2	–
Sputum	7 (7.1%)	–	–	–	–	–	–	–	3	4
Pus	5 (5.1%)	2	–	–	–	1	–	–	1	1
Total	98 (100%)	9	1	7	10	18	11	13	18	11

Table 2. Resistance of Gram positive bacteria to antibiotics *.

Bacteria	Antibiotic classes resistant to No. (%)													
	GM	AUG	CRO	CIP	TS	T	AZI	CD	OX	PG	RIF	VA	NOR	NI
Staphylococcus aureus	0 (0)	3 (37.5)	0 (0)	0 (0)	6 (66.6)	0 (0)	1 (12)	8 (100)	0 (0)	8 (100)	0 (0)	0 (0)	1 (50)	1 (50)
Staphylococcus epidermidis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Staphylococcus Saprophyticus	2 (28.5)	5 (83.3)	0 (0)	0 (0)	4 (57.1)	2 (28.5)	2 (28.5)	4 (80)	0 (0)	6 (100)	2 (28.5)	0 (0)	3 (42.8)	1 (14.2)
Enterococcus faecalis	8 (80)	8 (100)	5 (50)	6 (60)	6 (66.6)	7 (70)	5 (55.5)	4 (100)	0 (0)	2 (100)	2 (50)	0 (0)	8 (88.8)	0 (0)

* isolated from urine, wound swab, blood, sputum and pus specimens. GM=Gentamicin (10 mcg), AUG=Augmentin (30 mcg), CRO=Ceftriaxone (30 mcg), CIP=Ciprofloxacin (5 mcg), TS=Cotrimoxazole (25 mcg), T=Tetracycline (10mcg), AZI=Azithromycin (15 mcg),CD= Clindamycin (2 mcg), OX=Oxacillin (1 mcg), PG=Penicillin G (10 units), RIF=Rifampicin (5mcg), VA=Vancomycin (30mcg), NOR=Norfloxacin (10 mcg) and NI=Nitrofurntoin (300 mcg).

Table 3. Resistance of Gram negative bacteria to antibiotics*.

Bacteria	Antibiotic classes resistant to No. (%)													
	AMP	GM	AK	AUG	CEP	CRO	CIP	PIP	IMP	CAZ	MER	TS	T	AZI
Escherichia coli	3 (100)	4 (30)	0 (0)	13 (76)	0 (0)	4 (22.2)	4 (22.2)	1 (33.3)	0 (0)	1 (33.3)	0 (0)	8 (44.4)	8 (53.3)	5 (35.7)
Proteus mirabilis	5 (100)	4 (36.3)	0 (0)	10 (90.9)	2 (40)	5 (45.4)	3 (27.2)	2 (40)	0 (0)	1 (20)	0 (0)	10 (90.9)	7 (70)	4 (66.6)
Klebsiella pneumoniae	1 (100)	3 (23)	0 (0)	10 (76.9)	1 (100)	2 (15.3)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	7 (53.8)	9 (69.2)	1 (8.3)
Pseudomonas aeruginosa	2 (100)	7 (41.1)	1 (7.6)	8 (88.8)	10 (76.9)	12 (66.6)	4 (22.2)	1 (8.3)	0 (0)	4 (30.7)	0 (0)	5 (41.6)	5 (71.4)	5 (100)
Acinetobacter baumanii	Nill	10 (90.9)	8 (80)	4 (100)	10 (100)	11 (100)	11 (100)	10 (100)	0 (0)	10 (100)	0 (0)	11 (100)	1 (100)	1 (100)

*isolated from urine, wound swab, blood, sputum and pus specimens. AMP=Ampicillin (10 mcg), GM=Gentamicin (10 mcg), AK=Amikacin (30 mcg), AUG=Augmentin (30 mcg), CEP=Cephalothin (30 mcg), CRO=Ceftriaxone (30 mcg), CIP=Ciprofloxacin (5 mcg), PIP=Piperacillin (100 mcg), IMP=Imipenem (10 mcg), CAZ=Ceftizoxime (30 mcg), MER=Meropenem (10 mcg), TS=Cotrimoxazole (25 mcg), T=Tetracycline (10 mcg) and AZI=Azithromycin (15 mcg).

Table 4. The most resistant bacterial isolates to some antibiotics (Resistance incidence ≥ 50%).

Gram stain	Bacterial isolates	Antibiotic to which the isolate was resistant (≥ 50%)	Definition
Gram positive bacteria	Enterococcus faecalis	GM, AUG, CRO, CIP, TS, T, AZI, CD, PG, RIF, NOR	MDR
	Staphylococcus Saprophyticus	AUG, TS, CD, PG	MDR
	Staphylococcus aureus	CD, PG, NOR, NI	MDR
	Staphylococcus epidermidis	PG	Non-MDR
Gram negative bacteria	*Acinetobacter baumanii*	GM, AK, AUG, CEP, CRO, CIP, PIP, CAZ, TS, T, AZI	MDR
	Pseudomonas aeruginosa	AMP, AUG, CEP, CRO, T, AZI	MDR
	Klebsiella pneumonia	AMP, AUG, CEP, PIP, TS, T	MDR
	Proteus mirabilis	AMP, AUG, TS, T, AZI	MDR
	Escherichia coli	AMP, AUG, T	MDR

MDR= Multi Drug resistant bacteria. AMP=Ampicillin (10 mcg), GM=Gentamicin (10 mcg), AK=Amikacin (30 mcg), AUG=Augmentin (30 mcg), CEP=Cephalothin (30 mcg), CRO=Ceftriaxone (30 mcg), CIP=Ciprofloxacin (5 mcg), PIP=Piperacillin (100 mcg), IMP=Imipenem (10 mcg), CAZ=Ceftizoxime (30 mcg), MER=Meropenem (10 mcg), TS=Cotrimoxazole (25 mcg), T=Tetracycline (10 mcg), AZI=Azithromycin (15 mcg), CD= Clindamycin (2 mcg), OX=Oxacillin (1 mcg), PG=Penicillin G (10 units), RIF=Rifampicin (5mcg), VA=Vancomycin (30mcg), NOR=Norfloxacin (10 mcg) and NI=Nitrofurntoin (300 mcg).

Conclusions

This study revealed presence of numerous MDR strains from the tested clinical specimens against widely used antibiotics. Since the sample size was small, it is recommended for long term study to evaluate the susceptibility of different pathogens, in order to prescribe the suitable antibiotics to patients. The antibiotics are losing their efficacy and surveillance program is a must.

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For more information:

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