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(700) (104)

Pseudomonas (%14.8)

Enterobacter aerogenes, Escherichia coli, Klebsiella pneumoniae, aeruginosa
Serratia marcescens, Proteus mirabilis, Enterobacter cloacae,

-

(%52.9) Ceftazidime Cefotaxime Cefixime :

(%31.7) Cefoxitin (%42.3) (%51.9)

Imipenem Meropenem Cefepime :

Ps. (%1.0) (%1.9) (%8.7)

-

aeruginosa

Pr.mirabilis

K. pneumoniae

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Resistance of some Gram Negative Enteric Bacilli Isolated from Lower Respiratory Tract Infections to β -lactam Antibiotics

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ABSTRACT

One hundred and four isolates of gram negative enteric bacilli were isolated from (700) sputum specimens taken from lower respiratory tract infections with isolation percentage of (14.8%). The bacterial isolates belonged to the species: *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Escherichia coli*, *Enterobacter aerogenes*, *Enterobacter cloacae*, *Serratia marcescens*, *Proteus mirabilis*, with variable isolation percentages. The isolates showed an obvious resistance to different β -lactam antibiotics including third generation cephalosporins, where the resistance percentages to Cefixime, Cefotaxime, Ceftazidime reached (52.9%), (51.9%), (42.3%) respectively, they also showed resistance to Cefoxitin (31.7%), while Cefepime, Meropenem, Imipenem had a high activity against the isolates, as the resistance rates were reduced to reach (8.7%), (1.9%), (1.0%) respectively. *Ps.aeruginosa* isolates were the most resistant species to β -lactams, followed by *K.pneumoniae* isolates, while *Pr. mirabilis* isolates were the most susceptible ones.

Keywords: Resistance of Gram negative bacilli to β -lactam antimicrobials.

Pseudomonas

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aeruginosa

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.(Orrett, 2004 ; Wichard *et al.*, 2005 ; Choi *et al.*, 2008 ; Jean *et al.*, 2009)

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(Metlay *et al.*, 2006;

.Varaiya *et al.*, 2008; Jean *et al.*, 2009 ; Aminizadeh and Kashi, 2011)

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(PBPs)

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Porins

.(Bononi *et al.*, 2008; Varaiya *et al.*, 2008; Aminizadeh and Kashi, 2011)

-

(700)

(Forbes *et al.*, 2007; Bartlett *et* (48-24) ° (35)

.*al.*,1998)

.(Mac Faddin,1985; Forbes *et al.*, 2007; Winn *et al.*, 2006)

-

(20)

.Bioanalyse

-

National Committee for Clinical Laboratory Standards (NCCLS)

(0.5)

Trypton Soy broth

(5-3)

(0.5)

° (35)

.(Forbes *et al.*, 2007; NCCLS, 2003) ³ /

(⁸10x1)

(15)

-

()

(18-16) ° (35)

(NCCLS, 2003, 2004 ; Schwalbe *et al.*, 2007) NCCLS

(1) (104) (700)
 .(%14.8) *Ps.aeruginosa*

:1

(%)	
(3.7) 26	<i>Pseudomonas aeruginosa</i>
(3.6) 25	<i>Klebsiella pneumoniae</i>
(4.0) 28	<i>Escherichia coli</i>
(1.1) 8	<i>Enterobacter aerogenes</i>
(1.1) 8	<i>Serratia marcescens</i>
(0.7) 5	<i>Enterobacter cloacae</i>
(0.6) 4	<i>Proteus mirabilis</i>
(14.8) 104	

E.coli (1)

(%3.7) (%4.0)

K.pneumoniae Ps.aeruginosa

(%3.6)

(Crofton and Doglas,1988)

(968)

% (4.0-0.5)

K.pneumoniae

(Saeed *et al.*, 2009)

(Bartlett *et al.*,1998; Aminizadeh and Kashi, 2011)

(%1)

.....

. -

(20)

(9-2)

-

(2)

.Carbapenems

Monobactams

Cephalothin, Ampicillin :

(%85.6) (%85.6) (%93.3)

Amoxicillin,

-

Ps.aeruginosa

Amoxicillin, Ampicillin

(Livermore,1995;

:

.Bradford, 2001; Khan *et al.*, 2008; Saeed *et al.*, 2009)

(%34.6)

Cefdinir, Carbencillin, Ceftriaxone, Cefoperazone, Cefoxitin, Cefpodoxime

(%23.1) (%24.0) (%27.9) (%29.8) (%31.7)

-

-

.(Bradford, 2001)

(%20.2)

Aztreonam

Monobactams

(%8.7)

Cefepime

(Thomson and

Moland, 2001)

Carbapenems

(%1.9) (%1.0) Meropenem, Imipenem

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(Miriagou *et al.*, 2003; Luzzaro *et al.*, 2004; Patzer *et al.*, 2007; -
 - .Jean *et al.*, 2009)

(%51.0) (%85.6) Amoxicillin
 Amoxicillin Amoxicillin-Clavulinic Acid
 -
 Amoxicillin

-

%51.0 Amoxicillin
 .(Blazquez *et al.*,1993)
 - (9—3)
 .(3) *Ps.aeruginosa*
Ps.aeruginosa (Gradelski *et al.*, 2001; Jean *et al.*, 2009)
 -
 Carbapenems, Cephamycins, Monobactams

-

Carbapenems

-

(PBPs)

-(Khan *et al.*, 2008; Varaiya *et al.*, 2008; Dugal and Fernandes, 2011)

العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(93.3) 97	(4.8) 5	(1.9) 2	10	AM	Ampicillin
(85.6) 89	(10.6) 11	(3.8) 4	30	KF	Cephalothin
(85.6) 89	(2.9) 3	(11.5) 12	25	AX	Amoxicillin
(76) 79	(12.5) 13	(11.5) 12	30	CL	Cephalexin
(74) 77	(7.7) 8	(18.3) 19	30	CXM	Cefuroxime
(52.9) 55	(11.5) 12	(35.6) 37	5	CFM	Cefixime
(51.9) 54	(8.7) 9	(39.4) 41	30	CTX	Cefotaxime
(51) 53	(7.7) 8	(41.3) 43	20\10	AMC	Amoxicillin-Clavulinic acid
(42.3) 44	(12.5) 13	(45.2) 47	30	CAZ	Ceftazidime
(34.6) 36	(4.8) 5	(60.6) 63	10	CPD	Cefpodoxime
(31.7) 33	(3.9) 4	(64.4) 67	30	FOX	Cefoxitin
(29.8) 31	(5.8) 6	(64.4) 67	75	CEP	Cefoperazone
(27.9) 29	(2.9) 3	(69.2) 72	30	CRO	Ceftriaxone
(24) 25	(4.8) 5	(71.2) 74	100	PY	Carbencillin
(23.1) 24	(4.8) 5	(72.1) 75	5	CDR	Cefdinir
(20.2) 21	(4.8) 5	(75) 78	30	ATM	Aztreonam
(19.2) 20	(8.7) 9	(72.1) 75	30	ZOX	Ceftizoxime
(8.7) 9	(2.9) 3	(88.4) 92	30	FEP	Cefepime
(1.9) 2	(2.9) 3	(95.2) 99	10	MEM	Meropenem
(1) 1	(0) 0	(99) 103	10	IPM	Imipenem

Ps.aeruginosa

العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(100) 26	(0) 0	(0) 0	10	AM	Ampicillin
(96.15) 25	(3.85) 1	(0) 0	30	KF	Cephalothin
(100) 26	(0) 0	(0) 0	25	AX	Amoxicillin
(80.75) 21	(15.4) 4	(3.85) 1	30	CL	Cephalexin
(92.3) 24	(0) 0	(7.7) 2	30	CXM	Cefuroxime
(73.1) 19	(7.7) 2	(19.2) 5	5	CFM	Cefixime
(53.85) 14	(3.85) 1	(42.3) 11	30	CTX	Cefotaxime
(69.25) 18	(11.55) 3	(19.2) 5	20\10	AMC	Amoxicillin-Clavulinic acid
(34.6) 9	(11.55) 3	(53.85) 14	30	CAZ	Ceftazidime
(34.6) 9	(7.7) 2	(57.7) 15	10	CPD	Cefpodoxime
(61.55) 16	(11.55) 3	(26.9) 7	30	FOX	Cefoxitin
(11.55) 3	(7.7) 2	(80.75) 21	75	CEP	Cefoperazone
(38.5) 10	(0) 0	(61.5) 16	30	CRO	Ceftriaxone
(26.9) 7	(11.55) 3	(61.55) 16	100	PY	Carbencillin
(19.2) 5	(3.85) 1	(76.95) 20	5	CDR	Cefdinir
(26.9) 7	(3.85) 1	(69.25) 18	30	ATM	Aztreonam
(19.2) 5	(15.4) 4	(65.4) 17	30	ZOX	Ceftizoxime
(15.4) 4	(7.7) 2	(76.9) 21	30	FEP	Cefepime
(7.7) 2	(11.55) 3	(80.75) 21	10	MEM	Meropenem
(3.85) 1	(0) 0	(96.15) 25	10	IPM	Imipenem

- *K.pneumoniae* (4)
- : (5) *E.coli* .Meropenem, Imipenem
Cefotaxime Amoxicillin, Cephalothin, Ampicillin
Cefotaxime *Ent.aerogenes* .Cefixime, Ceftazidime,
(%37.5) Cefixime, Ceftazidime,
(%25.0) Cefpodoxime, Carbencillin, Cefdinir, Cefoxitin, Ceftriaxone
(6) Meropenem, Imipenem, Cefepime
(%100) Amoxicillin, Ampicillin *S.marcescens*
(%75.0) Cefuroxime, Cephalexin, Cephalothin
(%25.0) Ceftazidime, Ceftriaxone, Cefixime
(7) Meropenem, Imipenem, Cefepime, Cefoxitin

- *K. pneumoniae* : 4

العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قر ص)	الرمز	المضاد الحيوي
(100) 25	(0) 0	(0) 0	10	AM	Ampicillin
(92) 23	(8) 2	(0) 0	30	KF	Cephalothin
(80) 20	(8) 2	(12) 3	25	AX	Amoxicillin
(80) 20	(8) 2	(12) 3	30	CL	Cephalexin
(76) 19	(8) 2	(16) 4	30	CXM	Cefuroxime
(60) 15	(20) 5	(20) 5	5	CFM	Cefixime
(72) 18	(12) 3	(16) 4	30	CTX	Cefotaxime
(52) 13	(8) 2	(40) 10	20\10	AMC	Amoxicillin- Clavulinic acid
(60) 15	(16) 4	(24) 6	30	CAZ	Ceftazidime
(64) 16	(4) 1	(32) 8	10	CPD	Cefpodoxime
(36) 9	(0) 0	(64) 16	30	FOX	Cefoxitin
(56) 14	(8) 2	(36) 9	75	CEP	Cefoperazone
(28) 7	(0) 0	(72) 18	30	CRO	Ceftriaxone
(24) 6	(4) 1	(72) 18	100	PY	Carbencillin
(36) 9	(4) 1	(60) 15	5	CDR	Cefdinir
(12) 3	(8) 2	(80) 20	30	ATM	Aztreonam
(32) 8	(8) 2	(60) 15	30	ZOX	Ceftizoxime
(8) 2	(0) 0	(92) 23	30	FEP	Cefepime
(0) 0	(0) 0	(100) 25	10	MEM	Meropenem
(0) 0	(0) 0	(100) 25	10	IPM	Imipenem

- *E.coli* :5

العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(85.7) 24	(7.15) 2	(7.15) 2	10	AM	Ampicillin
(82.15) 23	(10.7) 3	(7.15) 2	30	KF	Cephalothin
(78.5) 22	(3.6) 1	(17.9) 5	25	AX	Amoxicillin
(71.4) 20	(10.7) 3	(17.9) 5	30	CL	Cephalexin
(57.15) 16	(10.7) 3	(32.15) 9	30	CXM	Cefuroxime
(50) 14	(7.15) 2	(42.85) 12	5	CFM	Cefixime
(57.15) 16	(7.15) 2	(35.7) 10	30	CTX	Cefotaxime
(39.25) 11	(3.6) 1	(57.15) 16	20\10	AMC	Amoxicillin- Clavulnic acid
(46.45) 13	(10.7) 3	(42.85) 12	30	CAZ	Ceftazidime
(28.6) 8	(3.6) 1	(67.8) 19	10	CPD	Cefpodoxime
(17.9) 5	(3.6) 1	(78.5) 22	30	FOX	Cefoxitin
(21.4) 6	(3.6) 1	(75) 21	75	CEP	Cefoperazone
(25) 7	(3.6) 1	(71.4) 20	30	CRO	Ceftriaxone
(28.6) 8	(0) 0	(71.4) 20	100	PY	Carbencillin
(25) 7	(3.6) 1	(71.4) 20	5	CDR	Cefdinir
(14.25) 4	(3.6) 1	(82.15) 23	30	ATM	Aztreonam
(10.7) 3	(3.6) 1	(85.7) 24	30	ZOX	Ceftizoxime
(3.6) 1	(0) 0	(96.4) 27	30	FEP	Cefepime
(0) 0	(0) 0	(100) 28	10	MEM	Meropenem
(0) 0	(0) 0	(100) 28	10	IPM	Imipenem

- *Ent.aerogenes* :6

العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(87.5) 7	(12.5) 1	(0) 0	10	AM	Ampicillin
(87.5) 7	(12.5) 1	(0) 0	30	KF	Cephalothin
(75) 6	(0) 0	(25) 2	25	AX	Amoxicillin
(75) 6	(25) 2	(0) 0	30	CL	Cephalexin
(87.5) 7	(12.5) 1	(0) 0	30	CXM	Cefuroxime
(37.5) 3	(12.5) 1	(50) 4	5	CFM	Cefixime
(37.5) 3	(12.5) 1	(50) 4	30	CTX	Cefotaxime
(50) 4	(12.5) 1	(37.5) 3	20\10	AMC	Amoxicillin- Clavulnic acid
(37.5) 3	(12.5) 1	(50) 4	30	CAZ	Ceftazidime
(25) 2	(12.5) 1	(62.5) 5	10	CPD	Cefpodoxime
(25) 2	(0) 0	(75) 6	30	FOX	Cefoxitin
(50) 4	(0) 0	(50) 4	75	CEP	Cefoperazone
(25) 2	(12.5) 1	(62.5) 5	30	CRO	Ceftriaxone
(25) 2	(0) 0	(75) 6	100	PY	Carbencillin
(25) 2	(12.5) 1	(62.5) 5	5	CDR	Cefdinir
(37.5) 3	(0) 0	(62.5) 5	30	ATM	Aztreonam
(37.5) 3	(12.5) 1	(50) 4	30	ZOX	Ceftizoxime
(12.5) 1	(12.5) 1	(75) 6	30	FEP	Cefepime
(0) 0	(0) 0	(100) 8	10	MEM	Meropenem
(0) 0	(0) 0	(100) 8	10	IPM	Imipenem

- *S.marcescens* :7

العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(100) 8	(0) 0	(0) 0	10	AM	Ampicillin
(75) 6	(25) 2	(0) 0	30	KF	Cephalothin
(100) 8	(0) 0	(0) 0	25	AX	Amoxicillin
(75) 6	(25) 2	(0) 0	30	CL	Cephalexin
(75) 6	(25) 2	(0) 0	30	CXM	Cefuroxime
(25) 2	(25) 2	(50) 4	5	CFM	Cefixime
(12.5) 1	(12.5) 1	(75) 6	30	CTX	Cefotaxime
(37.5) 3	(12.5) 1	(50) 4	20\10	AMC	Amoxicillin-Clavulinic acid
(25) 2	(12.5) 1	(62.5) 5	30	CAZ	Ceftazidime
(12.5) 1	(0) 0	(87.5) 7	10	CPD	Cefpodoxime
(0) 0	(0) 0	((100) 8	30	FOX	Cefoxitin
(25) 2	(12.5) 1	(62.5) 5	75	CEP	Cefoperazone
(25) 2	(12.5) 1	(62.5) 5	30	CRO	Ceftriaxone
(12.5) 1	(12.5) 1	(75) 6	100	PY	Carbencillin
(0) 0	(12.5) 1	(87.5) 7	5	CDR	Cefdinir
(37.5) 3	(12.5) 1	(50) 4	30	ATM	Aztreonam
(12.5) 1	(12.5) 1	(75) 6	30	ZOX	Ceftizoxime
(0) 0	(0) 0	(100) 8	30	FEP	Cefepime
(0) 0	(0) 0	(100) 8	10	MEM	Meropenem
(0) 0	(0) 0	(100) 8	10	IPM	Imipenem

- *Ent.cloacae* (8)

Cefepime, Aztreonam

Cefpodoxime (%20.0)

Pr.mirabilis (9) .Meropenem, Imipenem, Ceftizoxime,

Amoxicillin, Ampicillin

(%50.0) (%75.0)

Amoxicillin-Clavulinic Acid, Cefuroxime, Cephalothin, Cephalexin

Pr.mirabilis(Winn *et al.*, 2006 ; Wichard *et al.*, 2005 ;.Bononi *et al.*, 2008)

Ent.cloacae

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العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(80) 4	(20) 1	(0) 0	10	AM	Ampicillin
(60) 3	(20) 1	(20) 1	30	KF	Cephalothin
(80) 4	(0) 0	(20) 1	25	AX	Amoxicillin
(80) 4	(0) 0	(20) 1	30	CL	Cephalexin
(60) 3	(0) 0	(40) 2	30	CXM	Cefuroxime
(20) 1	(0) 0	(80) 4	5	CFM	Cefixime
(20) 1	(0) 0	(80) 4	30	CTX	Cefotaxime
(40) 2	(0) 0	(60) 3	20\10	AMC	Amoxicillin-Clavulnic acid
(20) 1	(20) 1	(60) 3	30	CAZ	Ceftazidime
(0) 0	(0) 0	(100) 5	10	CPD	Cefpodoxime
(20) 1	(0) 0	(80) 4	30	FOX	Cefoxitin
(40) 2	(0) 0	(60) 3	75	CEP	Cefoperazone
(20) 1	(0) 0	(80) 4	30	CRO	Ceftriaxone
(20) 1	(0) 0	(80) 4	100	PY	Carbencillin
(20) 1	(0) 0	(80) 4	5	CDR	Cefdinir
(20) 1	(0) 0	(80) 4	30	ATM	Aztreonam
(0) 0	(0) 0	(100) 5	30	ZOX	Ceftizoxime
(20) 1	(0) 0	(80) 4	30	FEP	Cefepime
(0) 0	(0) 0	(100) 5	10	MEM	Meropenem
(0) 0	(0) 0	(100) 5	10	IPM	Imipenem

Pr. mirabilis

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العزلات المقاومة العدد (%)	العزلات متوسطة الحساسية العدد (%)	العزلات الحساسة العدد (%)	التركيز (مايكروغرام/قرص)	الرمز	المضاد الحيوي
(75) 3	(25) 1	(0) 0	10	AM	Ampicillin
(50) 2	(25) 1	(25) 1	30	KF	Cephalothin
(75) 3	(0) 0	(25) 1	25	AX	Amoxicillin
(50) 2	(0) 0	(50) 2	30	CL	Cephalexin
(50) 2	(0) 0	(50) 2	30	CXM	Cefuroxime
(25) 1	(0) 0	(75) 3	5	CFM	Cefixime
(25) 1	(25) 1	(50) 2	30	CTX	Cefotaxime
(50) 2	(0) 0	(50) 2	20\10	AMC	Amoxicillin-Clavulnic acid
(25) 1	(0) 0	(75) 3	30	CAZ	Ceftazidime
(0) 0	(0) 0	(100) 4	10	CPD	Cefpodoxime
(0) 0	(0) 0	(100) 4	30	FOX	Cefoxitin
(0) 0	(0) 0	(100) 4	75	CEP	Cefoperazone
(0) 0	(0) 0	(100) 4	30	CRO	Ceftriaxone
(0) 0	(0) 0	(100) 4	100	PY	Carbencillin
(0) 0	(0) 0	(100) 4	5	CDR	Cefdinir
(0) 0	(0) 0	(100) 4	30	ATM	Aztreonam
(0) 0	(0) 0	(100) 4	30	ZOX	Ceftizoxime
(0) 0	(0) 0	(100) 4	30	FEP	Cefepime
(0) 0	(0) 0	(100) 4	10	MEM	Meropenem
(0) 0	(0) 0	(100) 4	10	IPM	Imipenem

Ps.aeruginosa

(Oteo *et al.*, 2005 ; Belongia *et al.*, 2005 ; Choi *et al.*, -
2008)

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(1999 2000 2003 2004)

(Karlowsky *et al.*, 2003;

.Orrett, 2004; Jean *et al.*, 2009)

- .(2000)

Enterobacter .(2003)

aerogenes

Pseudomonas .(2004)

aeruginosa

.(1999)

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