Yoğun Bakım Ünitelerinde Sorun Mikroorganizmalar ve Epidemiyolojisi

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Health care-associated infections
FACT SHEET

- Hastaneye yatışı yapılan her 100 hastanın;
  - Gelişmiş ülkelerde 7'sinde,
  - Gelişmekte olan ülkelerde 10'unda sağlık bakımı ile ilişkili enfeksiyon gözlenmektedir.
- Yüksek gelirli ülkelerde YBÜ'de yatan hastaların yaklaşık %30'unda en az bir sağlık bakımı ilişkili enfeksiyon gözlenmekte.
- Düşük ve orta gelirli ülkelerde YBÜ ilişkili enfeksiyon oranı yüksek gelirli ülkelerden ortalama 23 kat daha fazla saptanmakta;

World Health Organization. Health care-associated infections fact sheet. Available at: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf, 2016

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

Health care-associated infections
FACT SHEET

- YBÜ ilişkili enfeksiyon oranı düşük ve orta gelirli ülkelerde %4.4 ila %88.9 arasında değişmekte
- Frekans 1000 hasta gününde 42.7
  - Gelişmiş ülkelerde 17/1000 hasta günü; yaklaşık 3 kat fazla
- Santral kateter ya da invaziv aletlere bağlı enfeksiyonlar Almanya ve ABD'den bildirilenlerden 19 kat daha sık.

World Health Organization. Health care-associated infections fact sheet. Available at: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf, 2016

Risk Faktörleri

- Avrupa'da yapılan çok merkezli bir çalışmada YBÜ'lerinde enfeksiyon oranı %51'e varan oranlarda bulunmuştur.
- Endotrakeal entübasyon nozokomiyal enfeksiyon oranını 6-21 kat arttırmaktadır.
- SVK; tüm kan dolaşımı enfeksiyonlarının yaklaşık %97'sinden sorumlu
- Üriner kateterizasyon nozokomiyal İYE'ları için en büyük risk faktörü
- Nazotrakeal entübasyon nozokomiyal sinüzit için en önemli risk faktörü
- Enfeksiyon geliştiğinde YBÜ'de yatan hastalarda kalış süresi ve maliyet artmakta
- Enfeksiyon geliştiğinde mortalite oranı %30-50 civarında olmaktadır.

Rapid evolution and spread of carbapenemases among Enterobacteriaceae in Europe.

Clin Microbiol Infect 2012; **18**: 413-431

- Hem hastane hem de yoğun bakımlarda en önemli faktörlerden biri patojen mikroorganizmalarda direnç artışı.
- Direnç trendleri hastaneler arasında değişiklik gösterse de çok ilaca dirençli [multidrug-resistance (MDR)] mikroorganizma sıklığı giderek artmaktadır.
- Özellikle YBÜ'lerinde direnç oranlarının artışına katkıda bulunan bir çok faktör söz konusudur.
  - Antibiyotiklerin aşırı kullanımı (kolonizasyon-enfeksiyon ayrımı yapılmamasının da katkısı büyük) ,
  - YBÜ'de uzun süreli kalış
  - Vücut bütünlüğünü bozan alet kullanımı (kateterler vs)
  - Komorbiditelerin varlığı
  - İzolasyon prosedürlerinde eksiklik
  - Ülke içinde ve ülkeler arasında dirençli patojenlerim hızla yayılımı

Bad Bugs, No Drugs, No ESKAPE

Enterococcus faecium (VRE)

Staphylococcus aureus (MRSA)

Klebsiella pneumonia

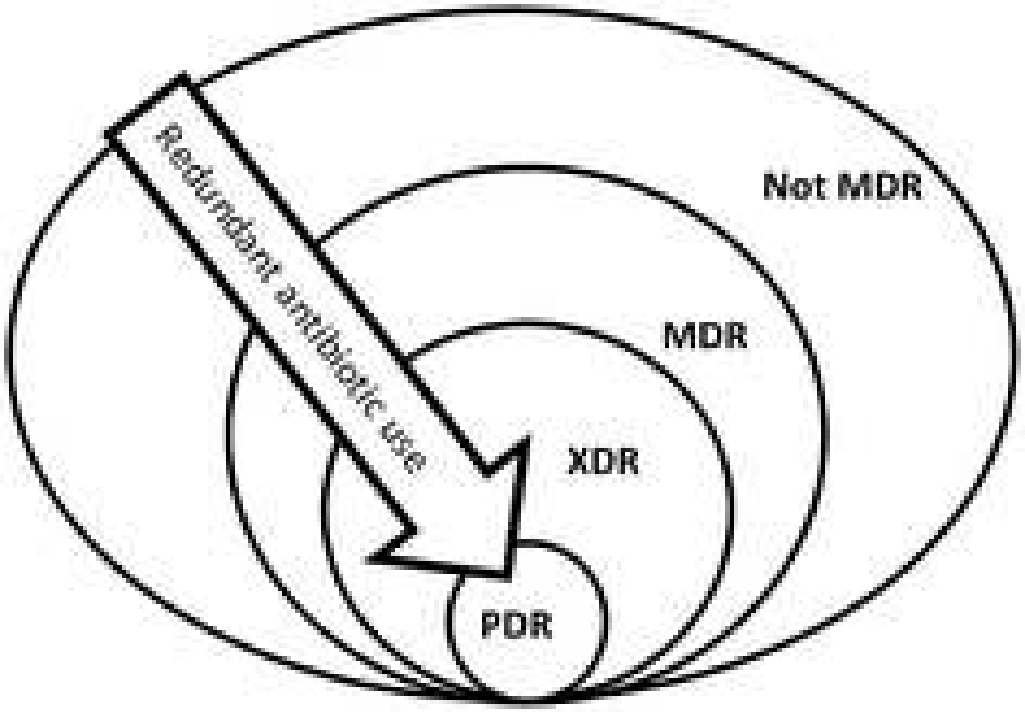
Acinetobacter baumannii

Pseudomonas aeruginosa

Enterobacteriaceae

- 2008 yılından itibaren bir grup patojen “ESKAPE” kısaltmasıyla ile tanımlanmış.
- Nozokomiyal enfeksiyonların 2/3’sini oluşturmakta
- Bu mikroorganizmalar direnç sorunu nedeni ile tedavide güçlük arz etmekte

Boucher, H.W., et al., Bad bugs, no drugs: no ESKAPE! An update from the Infectious Diseases Society of America. Clin Infect Dis, 2009. 48(1): p. 1-12.



Enterobacteriaceae'da MDR, XDR ve PDR tanımlamaları için kriterler

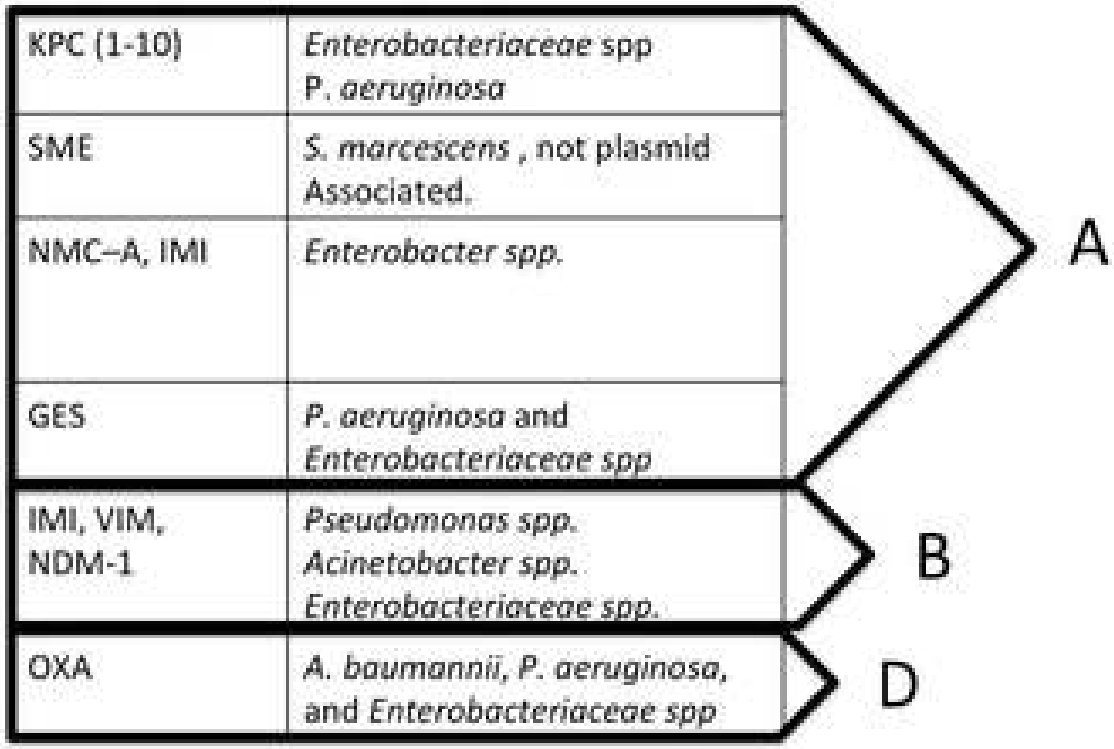
1.MDR: ≥3 antibiyotik sınıfında ≥1 ajana dirençli.

2.XDR: ≤2 antibiyotik sınıfında ≥1 ajana dirençli

3.PDR: Yukarıda gösterilen listedeki tüm antibiyotiklere dirençli.

4.Eğer bir patojende bir antibiyotik ya da tüm sınıfa intrinsik direnç varsa bu antibiyotik ya da sınıf listeden kaldırılarak tanımlama yapılmalı

Karbapenemaz Türleri



KPC Klebsiella pneumoniae carbapenemase,
SME Serratia marcescens enzyme,
MNC not metallo-carbapenemase,
IMI imipenem-hydrolyzing β-lactamase,
GES Guiana extended spectrum,
VIM Verona integron-encoded MBL,
NDM-1 New Delhi metallo-β-lactamase

Antimicrobial Resistance in the Intensive Care Unit: A Focus on Gram-Negative Bacterial Infections

Journal of Intensive Care Medicine
2017, Vol. 32(1) 25-37

DOI: 10.1177/0885066615619895
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Journal of Intensive Care Medicine, 2017; 32(1):25-37

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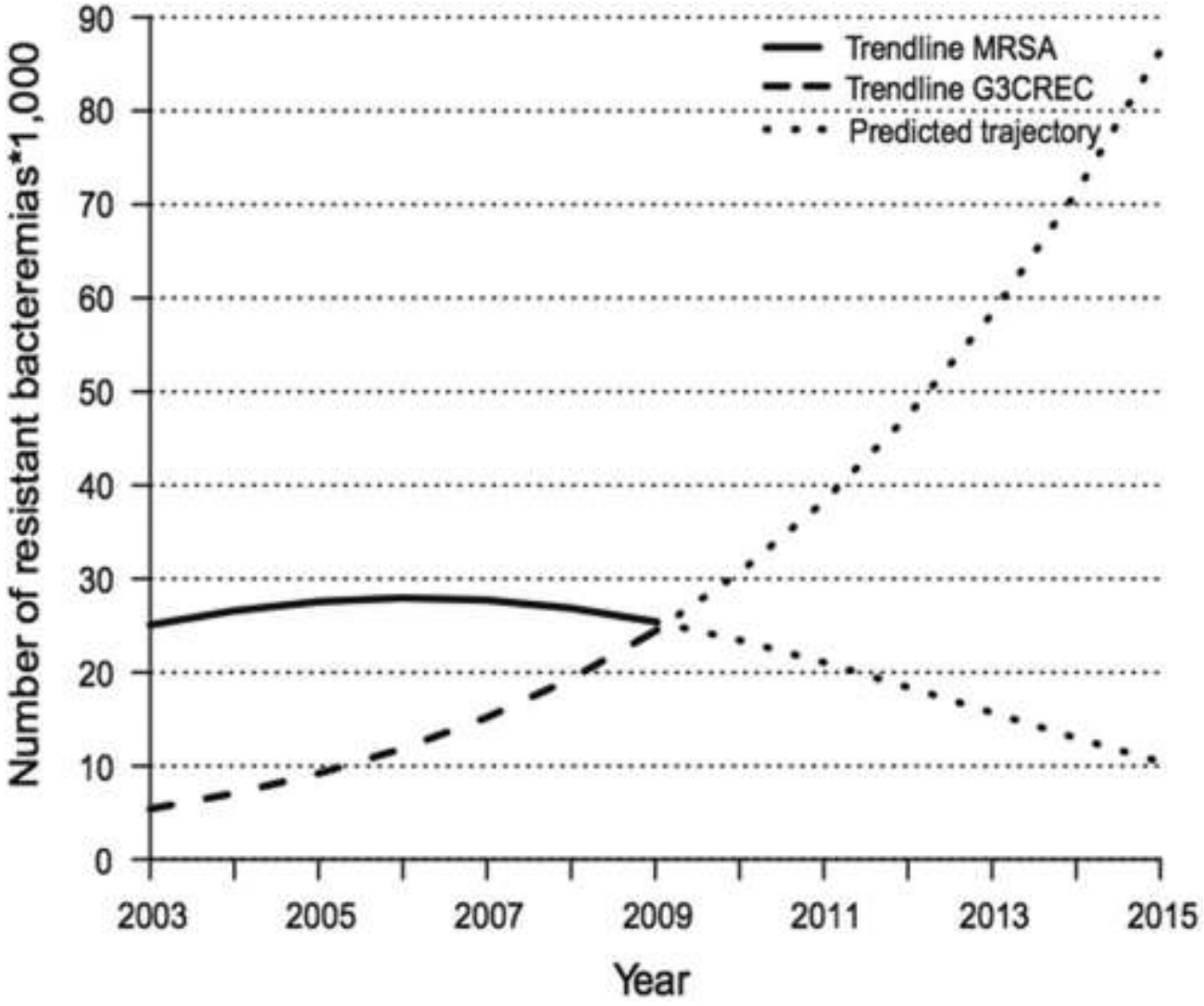

Figure 1. European trends in the estimated number of bacteremias caused by methicillin-resistant *Staphylococcus aureus* (MRSA) and third-generation cephalosporin-resistant *Escherichia coli*. Extrapolated numbers for 2003 to 2009; future trajectories based on regression analysis for 2010 to 2015.4

Shawn H. MacVane; *Journal of Intensive Care Medicine* 32, 25-37.

Table 2. Ranges for the Percentage of Resistance Among Pathogens in Common ICU-Related Infections in the United States.[26,a]

	% of Isolates With Resistance[b]			
	Fluoroquinolones	Extended-Spectrum Cephalosporins[c]	Multiple Drugs[d]	Carbapenem[e]
Enterobacter spp	NR	30.1-38.5	1.4-4.8[f]	3.6-4.6
Klebsiella pneumoniae/*Klebsiella oxytoca*	NR	23.8-28.8	13.4-16.8[f]	11.2-12.8
Escherichia coli	31.2-41.8[g]	12.3-19.0	2.0-3.7[f]	1.9-3.5
Acinetobacter baumannii	NR	NR	63.4-77.6[h]	61.2-74.2
Pseudomonas aeruginosa	30.5-33.5[i]	25.2-28.4[j]	14.0-17.7	21.3-30.2

Abbreviations: ICU, intensive care unit; NR, not reported.

[a] Adapted from Sievert et al,[26] National Healthcare Safety Network 2009 to 2010.

[b] Central line-associated bloodstream infection, catheter-associated urinary tract infection, and ventilator-associated pneumonia.

[c] Included 4 extended-spectrum cephalosporins: cefepime, ceftazidime, cefotaxime, and ceftriaxone.

[d] Defined as intermediate or resistant to ≥1 drug in 3 of 5 classes: extended-spectrum cephalosporins (cefepime and ceftazidime), fluoroquinolones (ciprofloxacin and levofloxacin), aminoglycosides, carbapenems, piperacillin, or piperacillin–tazobactam.

[e] Included 2 carbapenems: imipenem and meropenem.

[f] Included additional extended-spectrum cephalosporins (cefotaxime and ceftriaxone) and a fluoroquinolone (moxifloxacin).

[g] Included 3 fluoroquinolones: ciprofloxacin, levofloxacin, and moxifloxacin.

[h] Additional class included ampicillin–sulbactam.

[i] Included 2 fluoroquinolones: ciprofloxacin and levofloxacin.

[j] Included only cefepime and ceftazidime.

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ORIGINAL ARTICLE

Epidemiology and antimicrobial resistance among commonly encountered bacteria associated with infections and colonization in intensive care units in a university-affiliated hospital in Shanghai

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Hastane ve YBÜ'de izole edilen suşlar

Bakteri	İzolat no. (%)	
	Hastane (*n* = 24,764)	YBÜ (*n* = 2711)
Gram-pozitif izolatlar		
Staphylococcus aureus	2,826 (11.4%)	332 (12.3%)
KNS	2761 (11.1%)	168 (6.2%)
Enterococcus faecalis	1673 (6.8%)	73 (2.7%)
Enterococcus faecium	945 (3.8%)	166 (6.1%)
Gram-negatif izolatlar		
Escherichia coli	5414 (21.9%)	217 (8.0%)
Klebsiella pneumoniae	2320 (9.4%)	246 (9.1%)
Acinetobacter baumannii	2115 (8.5%)	481 (17.7%)
Pseudomonas aeruginosa	2230 (9.0%)	397 (14.6%)
Stenotrophomonas maltophilia	1058 (4.3%)	309 (11.4%)
Enterobacter	689 (2.8%)	86 (3.2%)
Proteus	449 (1.8%)	26 (1.3%)

En sık izole edilen YBÜ izolatları

- *A. baumannii* %17.7
- *P. aeruginosa* %14.6
- *S. maltophilia* %11.4
- *S. aureus* %12.3
- *K.pneumoniae* %9.1

Hastane ve YBÜ izole edilen örnekler göre sıklık

- *A.baumannii*, *P. aeruginosa*, *K. pneumoniae* ve *S. aureus;* en sık solunum yolu örneklerinden,
- *E. coli, Enterococcus faecalis* ve *E. faecium* en sık idrar ve safra örneklerinden
- *E. coli, S. epidermidis ve K. pneumoniae* kan örneklerinden en sık izole edilen etkenler
- YBÜ'lerinde *A. baumanii* solunum yolu, kateter ve kan örneklerinden izole edilen başlıca etken
- *Enterococcus faecium, E. coli ve P. aeruginosa* YBÜ'lerinde idrar örneklerinde sık

YBÜ'de izole edilen MDR suşlarda direnç oranı hastanede izole edilenlere göre çok daha yüksek

- MRSA: Hastanede %67.3% vs. YBÜ'de %94.3 [$p < 0.001$];
- XDR *A. baumannii:* %26.5 hastane vs. %39.1 YBÜ, ($p < 0.001$);
- XDR *P. aeruginosa:* %7.6 hastanede vs. %11.8 YBÜ'de ($p < 0.01$)

Prevalence of multidrug-resistant bacteria in hospital-wide, ICU, ICU-acquired, and ICU-on-admission izolatlar

Dirençli izolat sayısının toplam izolat sayısına oranı Sayı (%)				
	Hospital	ICU	ICU-acquired	ICU-on-admission
Methicillin-resistant *Staphylococcus aureus*	1902/2826 (67.3)	313/332 (94.3)*	187/187 (100)	61/62 (98.4)
XDR *Acinetobacter baumannii*	561/2115 (26.5)	188/481 (39.1)*	154/340 (45.2)	32/90 (35.6)
XDR *Pseudomonas aeruginosa*	170/2230 (7.6)	47/397 (11.8)*	24/272 (8.8)	0/113 (0)
ESBL-producing *Klebsiella pneumoniae*	455/2320 (19.6)	80/246 (32.5)*	48/169 (28.4)	19/77 (25.0)
ESBL-producing *Escherichia coli*	2350/5414 (43.4)	100/217 (46.0)*	55/145 (37.9)	22/44 (50.0

ICU = intensive care unit; ESBL = extended spectrum beta-lactamase; XDR = extensively drug-resistant.
*$p < 0.01$, for comparisons between hospital-wide and ICU isolated strains.

Table 2 Susceptibility rates of hospital-wide, ICU, ICU-acquired, and ICU-on-admission isolates

	Susceptibility rate (%)			
	Hospital	ICU	ICU-acquired	ICU-on-admission
Acinetobacter baumannii	$n = 2115$	$n = 481$	$n = 340$	$n = 90$
Amikacin	48.6	25.4*	23.2	35.6**
Trimethoprim-sulfamethoxazole	37.6	15.9*	11.2	24.4**
Ciprofloxacin	37.4	14.2*	12.1	20.0
Piperacillin/tazobactam	39.5	16.0*	15.3	22.2
Cefaperazone/sulbactam	61.4	48.0*	41.5	50.0
Ceftazidime	41.8	16.4*	14.1	27.8**
Cefepime	41.4	17.6*	13.2	25.6**
Imipenem	55.8	31.8*	23.8	44.4**
Meropenem	55.1	31.2*	24.1	37.8**
Pseudomonas aeruginosa	$n = 2230$	$n = 397$	$n = 272$	$n = 113$
Amikacin	76.1	77.0	80.9	89.4**
Ciprofloxacin	68.5	67.7	71	64.6
Piperacillin/tazobactam	74.3	64.1	68.4	69.9
Ceftazidime	73.7	60.7*	67.3	69.9
Cefepime	74.3	67.0	73.2	69.9
Imipenem	66.2	48.1*	39.3	76.1**
Meropenem	71.0	57.2*	58.5	76.1**

ICU = intensive care unit.

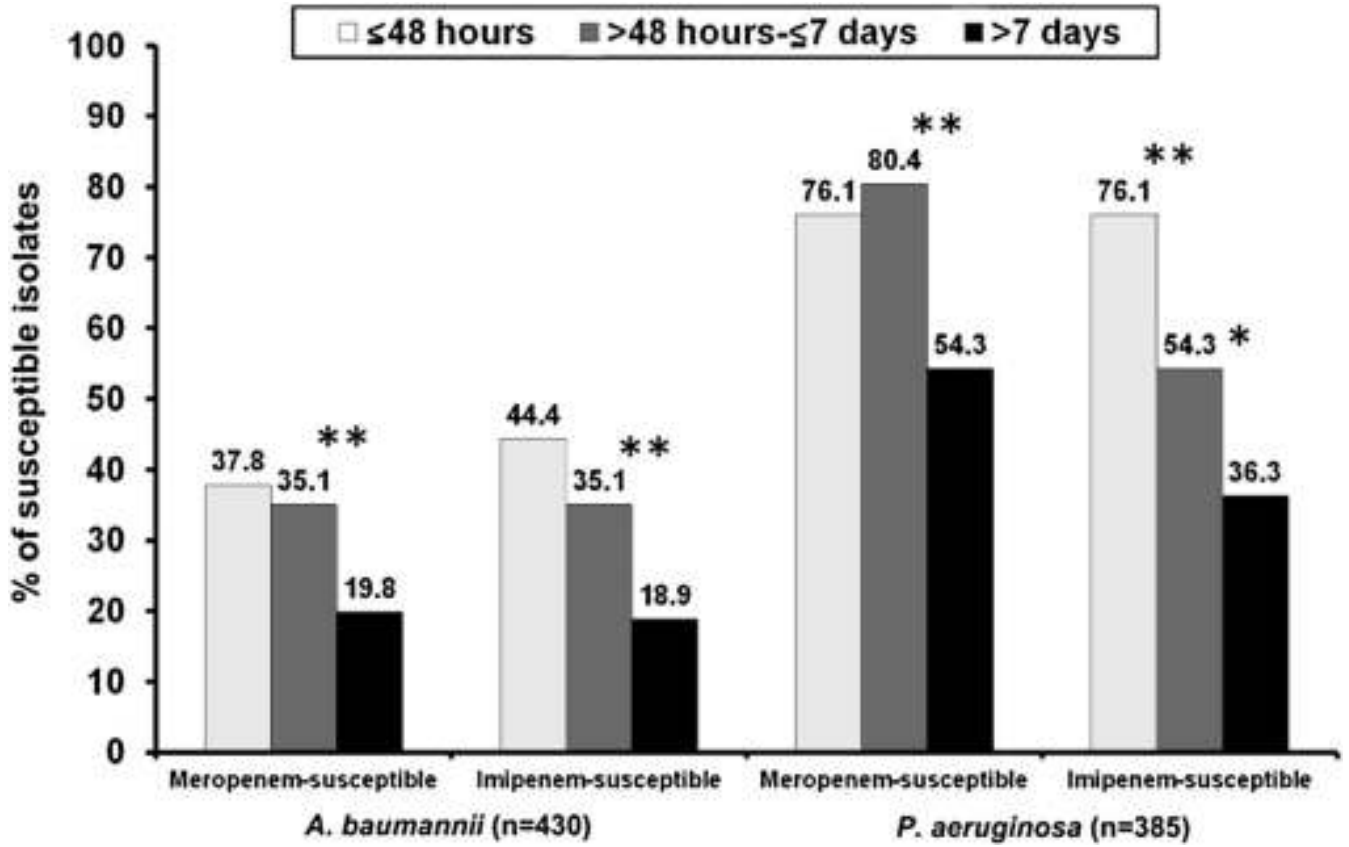
*$p < 0.001$, for comparisons between hospital-wide and ICU isolated strains.

**$p < 0.05$, for comparisons between ICU-acquired and ICU-on-admission strains.

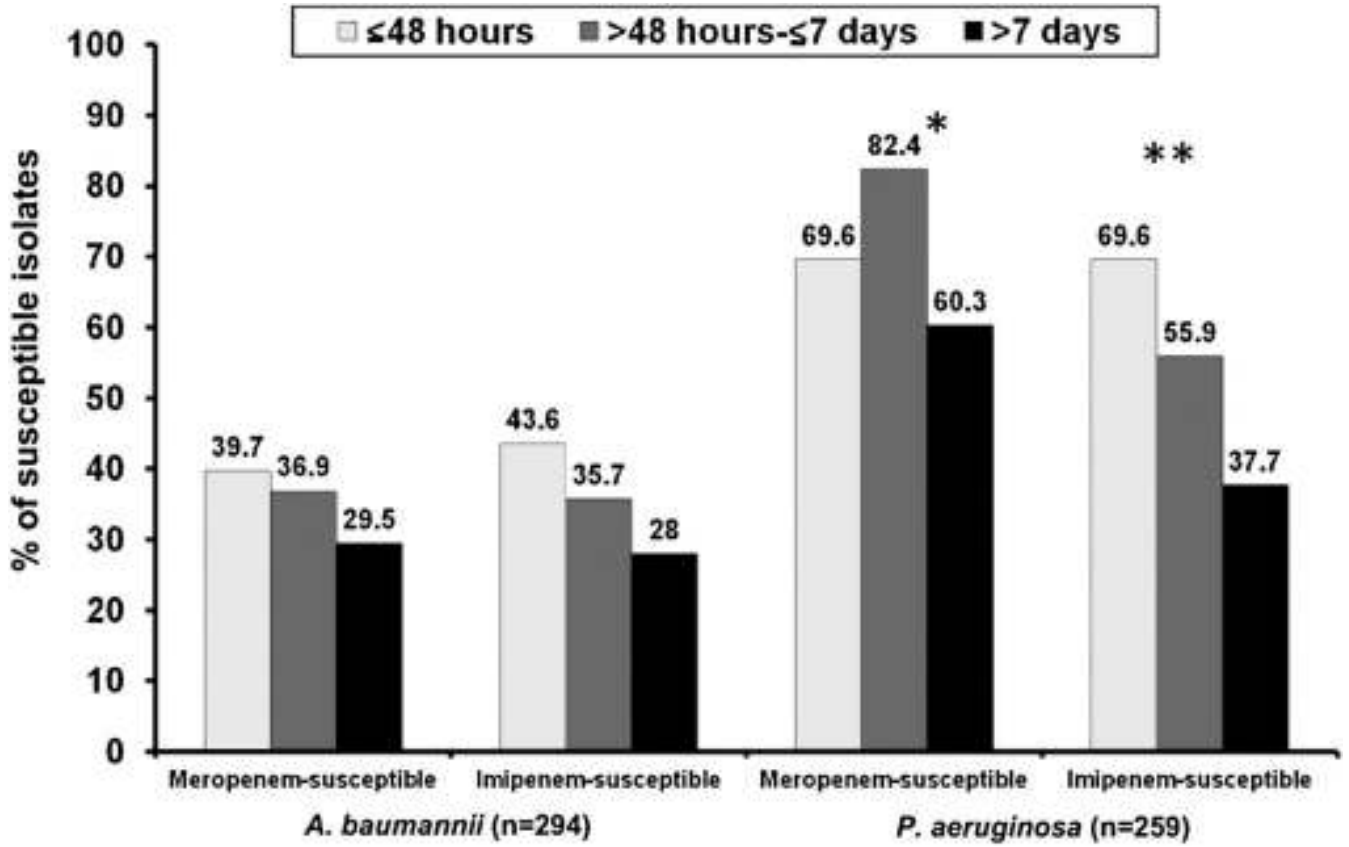
Table 2 Susceptibility rates of hospital-wide, ICU, ICU-acquired, and ICU-on-admission isolates

	Susceptibility rate (%)			
	Hospital	ICU	ICU-acquired	ICU-on-admission
Klebsiella pneumoniae	$n = 2320$	$n = 246$	$n = 169$	$n = 77$
Amikacin	88.3	73.3*	79.3	83.1
Ciprofloxacin	64.0	41.2*	52.7	49.4
Piperacillin/tazobactam	78.0	48.3*	56.8	71.4**
Ceftazidime	66.7	36.9*	66.3	66.2
Cefepime	66.8	36.3*	71.6	75.3
Imipenem	99.5	98.3	100.0	100.0
Meropenem	99.5	98.3	98.2	100.0
Escherichia coli	$n = 5414$	$n = 217$	$n = 145$	$n = 44$
Amikacin	79.4	79.4	78.6	79.5
Ciprofloxacin	31.3	12.4*	15.2	20.5
Piperacillin/tazobactam	78.6	71.8	74.5	65.9
Ceftazidime	46.4	27.5*	68.3	50.0**
Cefepime	46.4	26.1*	60.7	50.0
Imipenem	89.2	99.3*	100.0	100.0
Meropenem	89.2	98.9*	100.0	95.5

ICU = intensive care unit.
*$p < 0.001$, for comparisons between hospital-wide and ICU isolated strains.
**$p < 0.05$, for comparisons between ICU-acquired and ICU-on-admission strains.

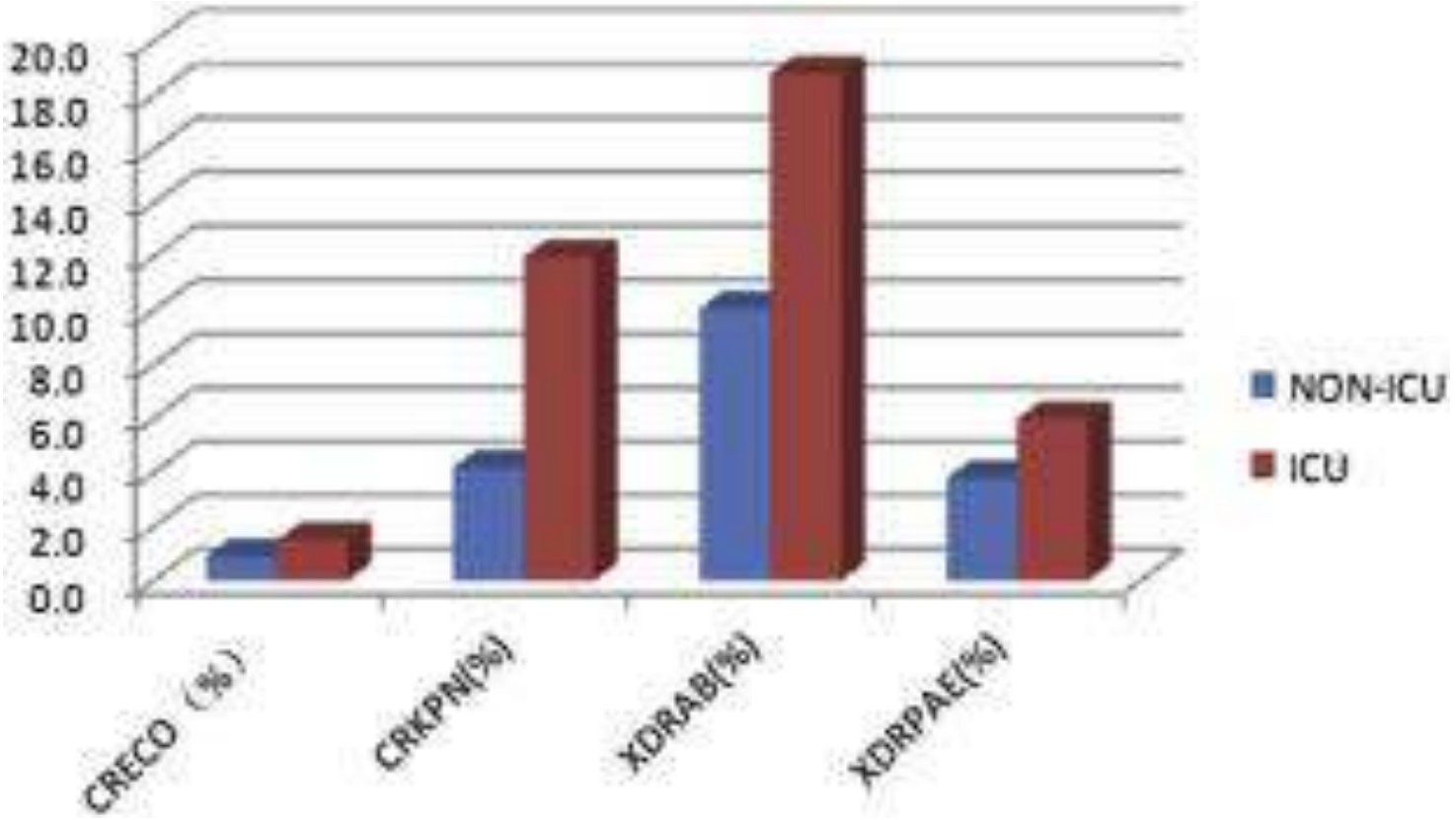


Relationship between length of ICU stay and susceptibility rates of *Acinetobacter baumannii* and *Pseudomonas aeruginosa* to carbapenems. *$p < 0.05$, for comparisons between 48 hours or less, from 48 hours up to 7 days, or more than 7 days. **$p < 0.01$, for comparisons between 48 hours or less, from 48 hours up to 7 days, or more than 7 days.



Relationship between susceptibility rates of *Acinetobacter baumannii* and *Pseudomonas aeruginosa* from sputum samples to carbapenems and the length of ICU stay. $*p < 0.05$, for comparisons between either 48 hours or less, from 48 hours up to 7 days, or more than 7 days. $**p < 0.01$ for comparisons between either 48 hours or less, from 48 hours up to 7 days, or more than 7 days.

National epidemiology of carbapenem-resistant and extensively drug-resistant Gram-negative bacteria isolated from blood samples in China in 2013



Incidence of carbapenem-resistant and extensively drug-resistant strains in different clinical settings. CRECO, carbapenem-resistant Escherichia coli; CRKPN, carbapenem-resistant Klebsiella pneumoniae; ICU, intensive care unit; XDRAB, extensively drug-...

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African Journal of Microbiology Research

Full Length Research Paper

Multidrug-resistant bacteria isolated from patients hospitalized in Intensive Care Unit in University Hospital of Constantine, Algeria (2011 - 2015)

Abla Hecini-Hannachi[1,2*], Chafia Bentchouala[1,3], Abdesselam Lezzar[1,3], Houcine Laouar[1,3], Kaddour Benlabed[1,3] and Farida Smati[1,3]

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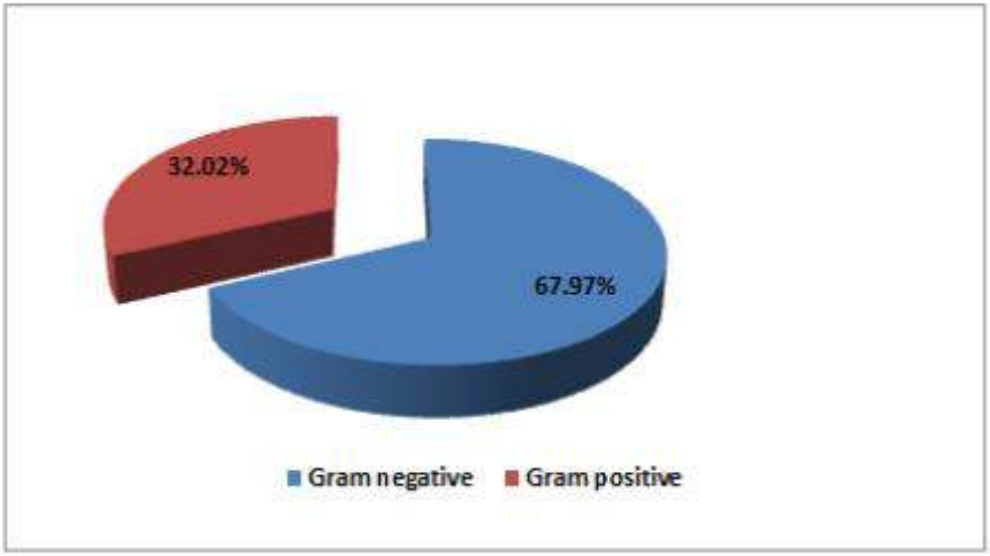
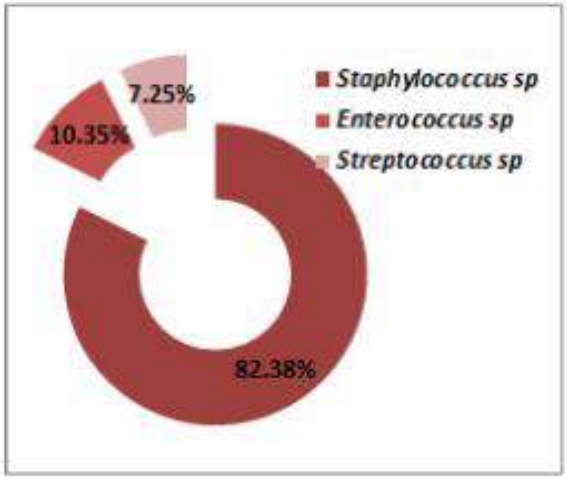




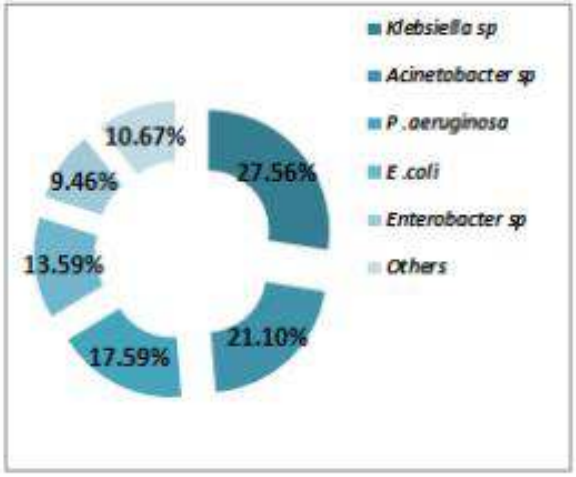


Figure 1. Prevalence of Gram positive and Gram negative isolates.

- MRSA, tüm S. aureus izolatlarının %65'ten fazlasını teşkil etmekte.
- *E. faecium* suşlarının %30.3'ü vankomisine dirençli
- Extended spectrum β-lactamase üreten suşların %53.2'si *K. pneumoniae* and 50.6'si *E. coli*.
- Karbapenem dirençli *K. pneumoniae* suşlarında artış saptanmış (%2.89'den %4.21'e çıkmış).
- *A. baumannii* izolatları colistin hariç (%100 duyarlı) diğer tüm antibiyotiklere yüksek oranda dirençli saptanmış.
- İlaveten *A. baumannii* izolatlarının %80.4'ü imipeneme dirençli bulunmuş.
- *P. aeruginosa* izolatlarında imipenem direnci %36.4 olarak saptanmış.

Table 3. Prevalence of clinical isolates.

Organisms	2011	2012	2013	2014	2015	Total(%)
Staphylococcus sp.	174	218	203	150	186	931(26.38)
Klebsiella sp.	124	143	154	140	100	661(18.73)
Acinetobacter sp.	112	96	119	107	72	506(14.34)
Pseudomonas aeruginosa	138	110	80	64	30	422(11.96)
Escherichia coli	60	65	70	84	47	326(9.24)
Enterobacter sp.	61	61	47	38	20	227(6.43)
Enterococcus sp.	31	26	14	28	18	117(3.31)
Proteus sp.	30	13	17	12	11	83(2.34)
Streptococcus sp.	18	22	12	14	16	82(2.32)
Serratia sp.	12	23	22	15	9	81(2.29)
Shigella sp.	0	0	0	30	2	32(0.90)
Providencia sp.	0	11	5	6	2	24(0.68)
Haemophilus influenzae	4	8	3	0	0	15(0.42)
Morganella sp.	0	1	4	3	1	9(0.25)
Stenotrophomonas sp.	0	0	0	5	1	6(0.17)
Salmonella sp.	0	1	1	0	2	4(0.11)
Citrobacter sp.	1	1	0	0	0	2(0.05)

Table 5. Antimicrobial resistance of major four isolates Gram negative, stratified by year.

Organism/antimicrobial agent	Resistance rate (%) / Year					
	2011	2012	2013	2014	2015	Mean
Acinetobacter baumanii	**n=101**	**n=95**	**n=108**	**n=102**	**n=69**	
Ticarcillin	100	95.78	98.14	98.03	95.65	97.52
Piperacillin	98.01	97.89	98.14	98.03	95.65	97.54
Ceftazidime	95.04	98.89	94.44	95.09	95.65	95.82
Amikacin	72.27	57.89	70.37	66.66	86.95	70.82
Gentamycin	73.26	92.63	84.25	91.17	95.65	87.39
Ciprofloxacin	85.14	87.36	88.88	98.03	81.15	88.11
Pefloxacin	89.10	91.57	92.59	91.17	81.15	89.11
Trimethoprim-sulfamethoxazole	93.06	89.47	92.59	96.07	95.65	93.36
Colistin	0	0	0	0	0	0
Pseudomonas aeruginosa	**n=138**	**n=110**	**n=80**	**n=64**	**n=30**	
Ticarcillin	28.98	36.84	25	26.56	36.66	30.80
Piperacillin	16	24.6	27.5	84.37	36.66	37.82
Ceftazidime	23.91	11.81	18.75	78.12	20	30.51
Amikacin	4.34	3	3.75	79.68	23.33	22.82
Gentamycin	18	27.1	22.5	64.06	20	30.33
Ciprofloxacin	8	25.4	15	50	50	29.68
Pefloxacin	30	44	60	65	50	49.8
Trimethoprim-sulfamethoxazole	72.46	94.54	90	90.62	83.33	86.19
Colistin	0	0	0	0	0	0

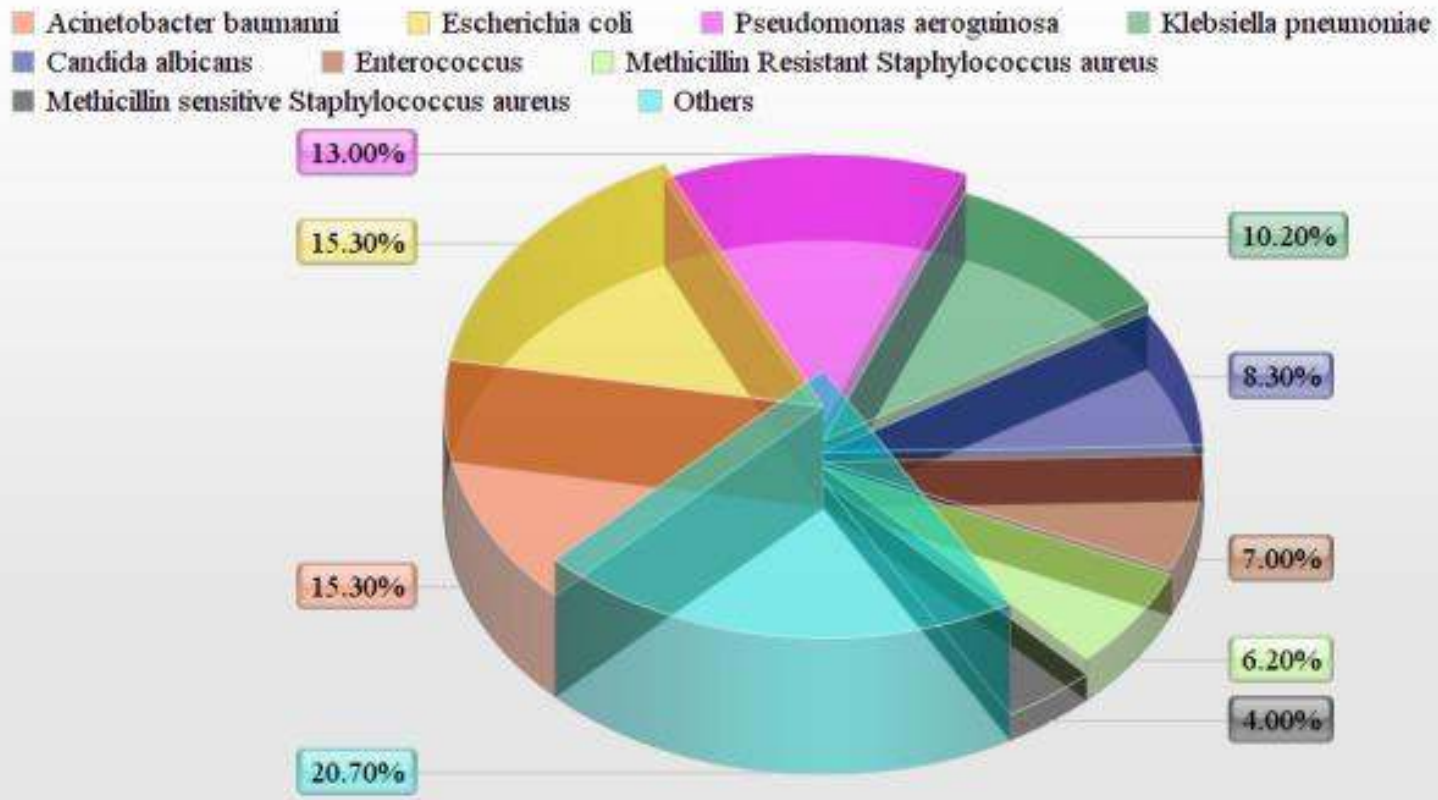
Klebsiella pneumoniae	**n=121**	**n=125**	**n=138**	**n=129**	**n=95**	
Ticarcillin	100	100	100	100	100	100
Amoxicillin/clvulinat	66.94	88	86.95	78.29	78.94	79.82
Cefazolin	84.29	86.4	90.57	88.37	76.84	85.29
Imipenem	0	0	2.89	4.65	4.21	2.35
Amikacin	23.14	6.4	25.36	29.45	21.05	21.08
Gentamycin	74.38	81.6	61.59	66.66	54.73	67.79
Ciprofloxacin	41.32	38.4	21.73	48.06	33.68	36.63
Trimethoprim-sulfamethoxazole	67.5	82.64	74.63	68.21	56.84	69.96
Colistin	0	0	0	0	0	0

Escherichia coli	**n=60**	**n=65**	**n=70**	**n=84**	**n=47**	
Ticarcillin	95	70.76	94.28	75	78.72	82.65
Amoxicillin/clavulinat	41.66	92.30	68.51	52.38	68.08	64.57
Cefazolin	46.66	100	50	67.85	51.06	63.11
Imipenem	0	0	0	0	0	0
Amikacin	6.66	13.84	2.85	44.04	8.51	15.18
Gentamycin	38.33	66.15	18.57	21.42	34.04	35.70
Ciprofloxacin	43.33	21.53	80	47.61	46.8	47.85
Trimethoprim-sulfamethoxazole	66.66	62.5	52.30	55.95	53.19	58.12
Colistin	0	0	0	0	0	0

Antibiogram of Medical Intensive Care Unit at Tertiary Care Hospital Setting of Pakistan

Cureus. 2016 Sep; 8(9): e809.

- 328 hastada (%40.89%) üreme var
- 265/328 (%81.5) bakteriyel izolat
- 64/328 (%18.5) *Candida albicans*.
- En sık izole edilen etkenler:
  - *Acinetobacter baumannii* (%15.3),
  - *Escherichia coli* (%15.3),
  - *Pseudomonas aeruginosa* (%13),
  - *Klebsiella pneumoniae* (%10.2).


Acinetobacter baumanni
Escherichia coli
Pseudomonas aeroguinosa
Klebsiella pneumoniae
Candida albicans
Enterococcus
Methicillin Resistant Staphylococcus aureus
Methicillin sensitive Staphylococcus aureus
Others
13.00%
15.30%
10.20%
8.30%
7.00%
15.30%
6.20%
4.00%
20.70%


Acinetobacter baumanni
Escherichia coli
Pseudomonas aeruginosa
Klebsiella pneumoniae
Resistance (%)
Ceftriaxone/Ceftazidime
Nitrofurantoin
Co-trimoxazole
Ciprofloxacin
Cefoperazone/Sulbactam
Gentamicin
Piperacillin/Tazobactam
Doxycycline
Meropenem/Imipenem
Amikacin
Chloramphenicol
Colistin
Fosfomycin
Minocycline
Tigecycline
Ampicillin
Teicoplanin

Antimicrobial susceptibility of Gram-negative organisms isolated from patients hospitalized in intensive care units in United States and European hospitals (2009-2011).

Diagn Microbiol Infect Dis. 2014 Apr;78(4):443-8.

SENTRY Antimicrobial Surveillance Programı; Ocak 2009 - Aralık 2011

- YBÜ'lerinden izole edilen 5989 bakteriyel izolat
  - 3445 ABD,
  - 2544 Avrupa
- YB dışı 17,244 izolat (9271 ABD, 7973 Avrupa) ile kıyaslanmış.
- YBÜ'de en sık izole edilen etkenler; *Escherichia coli*, *Klebsiella* spp., ve *Pseudomonas aeruginosa*
- Ardından *Enterobacter* spp., *Serratia* spp., *Haemophilus influenzae*, *Acinetobacter* spp., ve *Proteus mirabilis*.

ESBL (+) *E. coli* ve *Klebsiella* spp.

- YBÜ'den izole edilen *E. coli* suşlarında ESBL oranlarında artış sözkonusu;
  - ABD; %13.7,
  - Avrupa %16.6
- Amikacin (%90.5-94.8% duyarlı),
- Kolistin (%99.8-100.0 ≤2 µg/mL inhibe edilmekte),
- İmipenem (%95.5-96.0),
- Meropenem (%95.4-95.8),
- Tigecycline (%96.3-98.0%) *Klebsiella* spp. suşlarına iyi etkinlik göstermekte
- ESBL-fenotipi hem E. coli hem de Klebsiella spp. türlerinde artış göstermekte.
- Klebsiella spp. suşlarında Avrupa'da artış sözkonusu (2009'da %27.5 iken 2011'de %41.8'e çıkmıştır; P = 0.015 ve odds ratio = 0.89 [95% confidence interval, 1.13-3.18]).

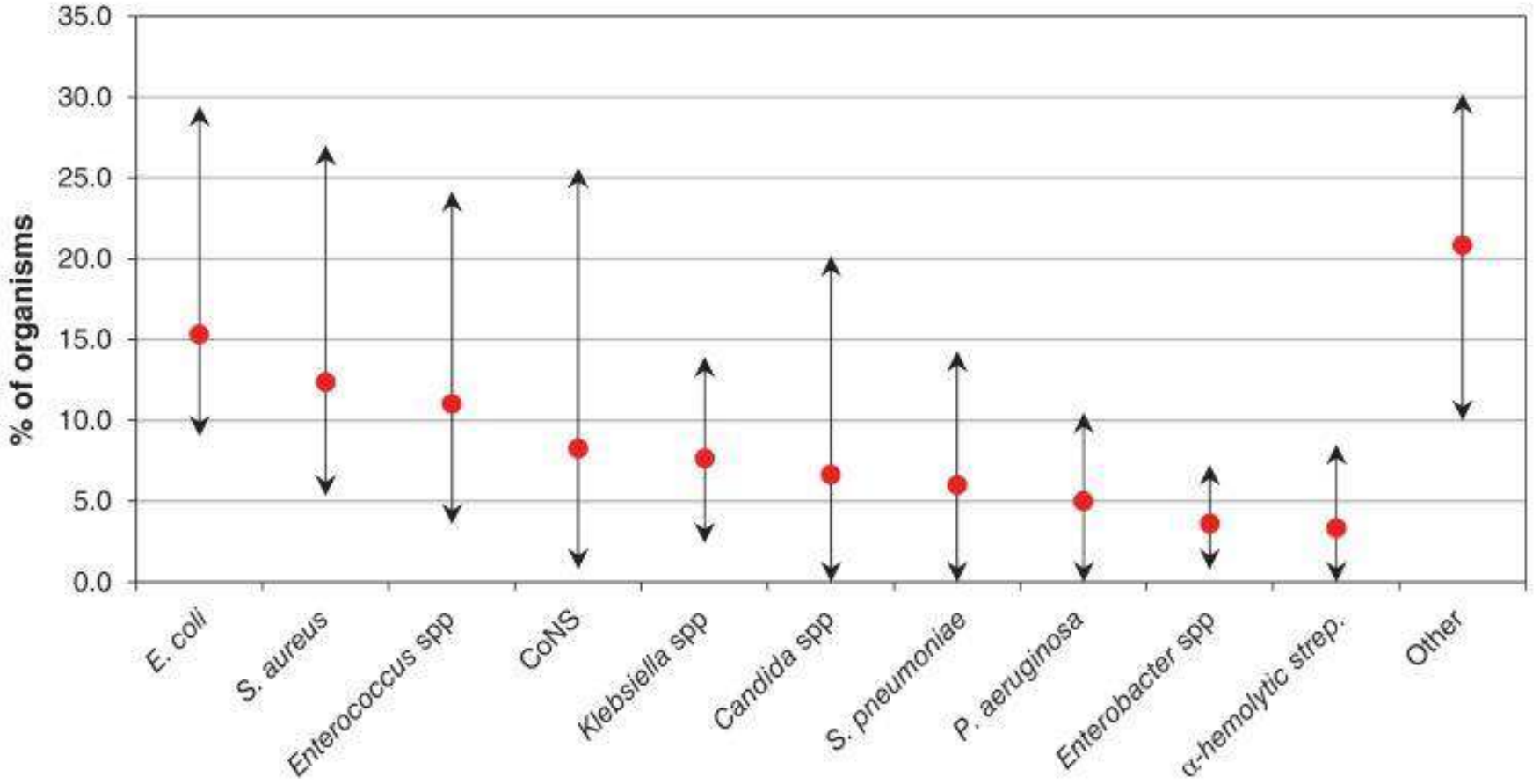
- ABD'de *Klebsiella* suşlarında meropenem duyarlılığı artarken Avrupa'da ciddi oranda azalmış;
  - 2009'da %100 iken
  - 2011'de %89.7'a düşmüş.
- P. aeruginosa suşları;
  - Sadece kolistin (99.4%) ve
  - Amikasin (ABD'de %97.3, Avrupa'da %84.9) duyarlı.

Pathogens and antimicrobial susceptibility profiles in critically ill patients with bloodstream infections: a descriptive study

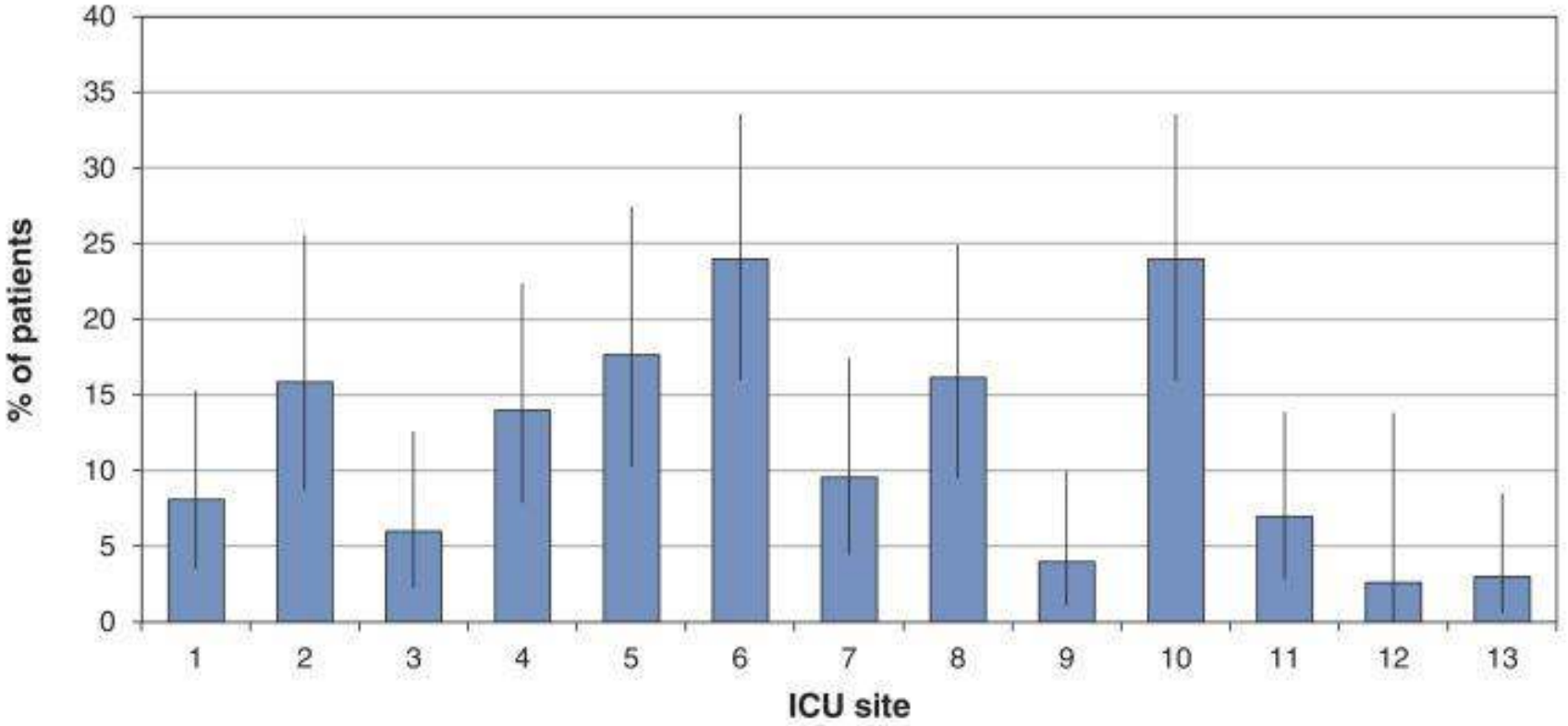
CMAJ Open. 2016 Oct-Dec; 4(4):E569–E577

- ‘’Bacteremia Antibiotic Length Actually Needed for Clinical Effectiveness’’ kapsamında yapılan,

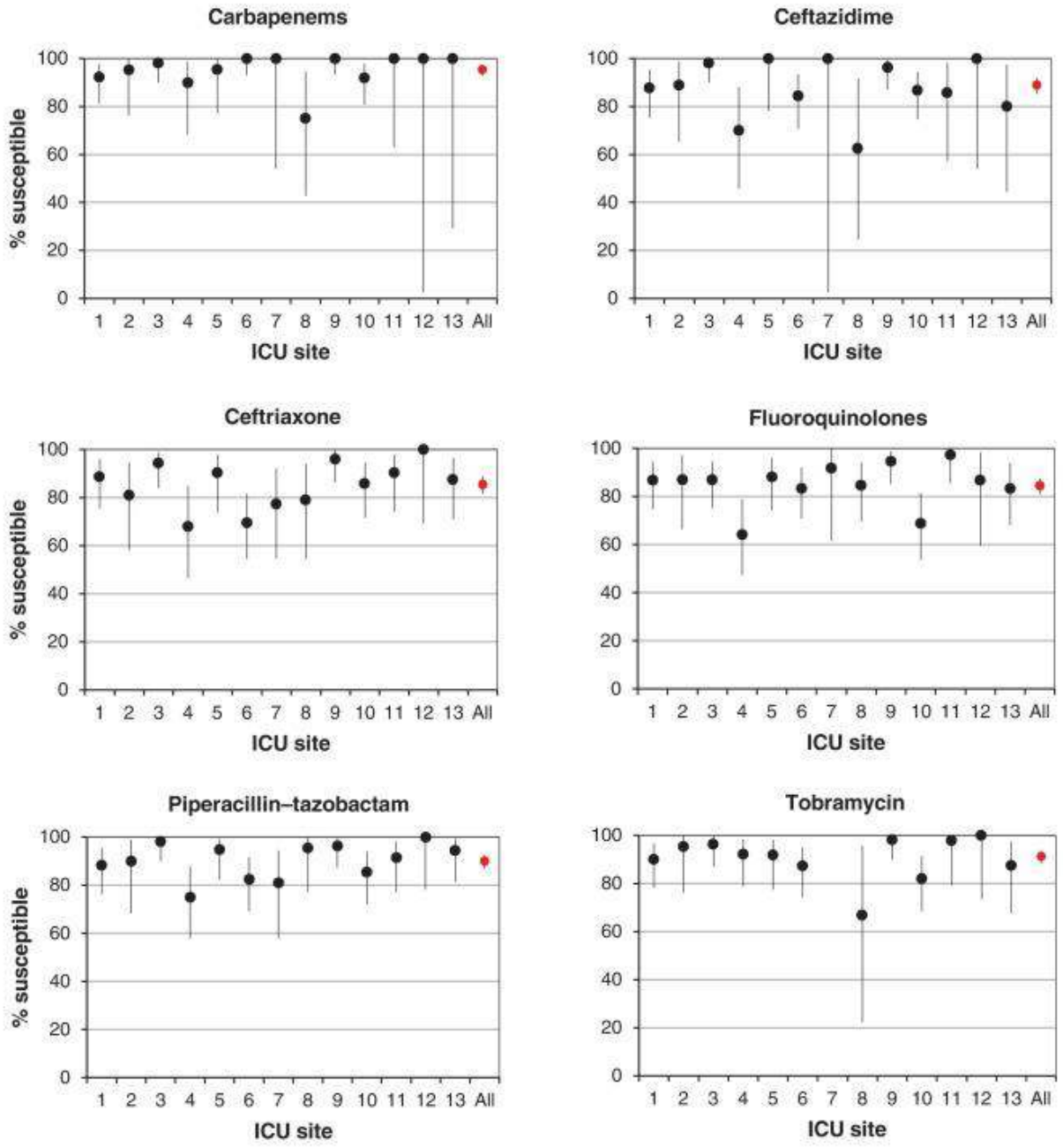
- Kanada’da 13 YBÜ’nin dahil olduğu bir çalışma



13 Yoğun Bakım Ünitesinde izole edilen patojenlerin dağılımı.



13 YBÜ'de yüksek derecede dirençli (n=145) mikroorganizmaların dağılımı



Variation in susceptibility to antibacterial agents in patients with gram-negative bloodstream infections (n = 558) across 13 intensive care units. Error bars represent 95% confidence intervals.

ORIGINAL ARTICLE

Changed epidemiology of ICU acquired bloodstream infections over 12 years in an Italian teaching hospital

G. B. ORSI [1], S. GIULIANO [1], C. FRANCHI [2], V. CIORBA [3], C. PROTANO [1], A. GIORDANO [1], M. ROCCO [4], M. VENDITTI [1]

[1]Department of Public Health and Infectious Diseases, "Sapienza" University of Rome, Rome, Italy; [2]Department of Clinical Medicine, "Sapienza" University of Rome, Rome, Italy; [3]Department of Biomedical, Biotechnological and Translational Sciences (SBiBiT), University of Parma, Parma, Italy; [4]Anesthesiology and Intensive Care, "Sapienza" University of Rome, Rome, Italy

Minerva Anestesiologica 2015 September;81(9):980-8

TABLE II.—*Distribution of microorganisms responsible for ICU-acquired laboratory confirmed bloodstream infection.*

Microorganism	2000-2007 Period		2010-2012 Period		Total		P
	Isolates	%	Isolates	%	Isolates	%	
MRSA	32	(14.9%)	2	(1.7%)	34	(10.3%)	<0.0001*
MSSA	5	(2.3%)	2	(1.7%)	7	(2.1%)	1.00*
CNS-MR	56	(26.3%)	17	(14.9%)	73	(22.2%)	0.02
CNS-MS	5	(2.3%)	-	-	5	(1.5%)	-
Enterococcus spp.	2	(0.9%)	3	(2.6%)	5	(1.5%)	0.35*
E. faecalis	13	(6.1%)	3	(2.6%)	16	(4.9%)	0.19*
E. faecium	5	(2.3%)	4	(3.5%)	9	(2.7%)	0.72*
Total Gram+	118	(55.1%)	31	(26.9%)	149	(45.3%)	<0.0001
A. baumannii	16	(7.5%)	23	(20.0%)	39	(11.8%)	<0.001
Aeromonas spp.	1	(0.5%)		-	1	(0.3%)	-
Citrobacter freundi †		-	1	(0.9%)	1	(0.3%)	-
Enterobacter spp. †	5	(2.3%)	3	(2.6%)	8	(2.4%)	1.00*
E. coli †	5	(2.3%)	1	(0.9%)	6	(1.8%)	0.70*
Klebsiella spp. †	12	(5.6%)	36	(31.3%)	48	(14.6%)	<0.0001
(KPC-CR-Kp) #			31#	(27.0%)#	31#	(9.4%)#	-
Morganella spp. †	1	(0.5%)	1	(0.9%)	2	(0.6%)	1.00*
Proteus spp. †	2	(0.9%)	3	(2.6%)	5	(1.5%)	0.35*
Providencia spp. †	2	(0.9%)	-	-	2	(0.6%)	-
P. aeruginosa	29	(13.6%)	12	(10.4%)	41	(12.5%)	0.41
S. maltophilia	7	(3.3%)	-	-	7	(2.1%)	-
S. marcescens †	6	(2.8%)	-	-	6	(1.8%)	-
All *Enterobacteriaceae*	33	(15.4%)	45	(39.1%)	78	(23.7%)	<0.0001
Total Gram-	86	(40.2%)	80	(69.6%)	166	(50.5%)	<0.0001
Candida spp.	10	(4.7%)	4	(3.5%)	14	(4.2%)	0.78*
TOTAL	214	100,0%	115	100,0%	329	100,0%	

MRSA: Methicillin resistant S. *aureus*; MSSA: Methicillin susceptible S. *aureus*; CNS-MR: methicillin resistant coagulase negative staphylococci; CNS-MS: Methicillin susceptible coagulase negative staphylococci; † *Enterobacteriaceae*; #KPC-CR-Kp strains are a subgroup of the overall Klebsiella.

P values are obtained using the χ^2 corrected test except when indicated by (*) which are obtained from the Fisher exact test.

- Toplam 329 izolat:
  - 214'ü 2000-2007 arasında
  - 115'i 2010-2012 arasında.
- 2. periyotta;
  - Gram-pozitiflerde azalma (55.1% vs. 26.9%; P<0.01)
  - Gram-negatiflerde artış (40.2% vs. 69.6%; P<0.01).
- LK-KDİ'larında Stafilokoklar;
  - 2000-2007 arasında %45.8
  - 2010-2012 arasında %18.3
- Enterobacteriaceae'da dramatik artış (15.4% vs. 39.2%; P<0.01),
  - özellikle *Klebsiella* spp. (5.6% vs. 31.3%; P<0.01).

- **LK-KDİ enfeksiyonlarında;**
  - Gram-pozitiflerin oranında azalma (56.8% vs. 51.6%),
  - Gram-negatiflerde artış (41.9% vs. 60.0%; P<0.03),
  - Özellikle Enterobacteriaceae'da artış var

    (RR 2.13; 95% CI 1.21 - 3.73; P<0.01).
- Enterobacteriaceae üyelerinde MDR artışı çok fazla (51.5% vs. 73.3%).

Original Article

Gram-negative bacilli causing infections in an intensive care unit of a tertiary care hospital in Istanbul, Turkey

Seniha Senbayrak Akcay[1], Asuman Inan[1], Simin Cevan[2], Ayse Nilufer Ozaydin[3], Naz Cobanoglu[2], Seyfi Celik Ozyurek[1], Sebahat Aksaray[2]

[1] *Department of Infectious Diseases and Clinical Microbiology, Haydarpasa Numune Education and Research Hospital, Uskudar, Istanbul, Turkey*
[2] *Department of Microbiology and Clinical Microbiology, Haydarpasa Numune Education and Research Hospital, Uskudar, Istanbul, Turkey*
[3] *Department of Public Health, Marmara University, Faculty of Medicine, Uskudar, Istanbul, Turkey*

2004-2001 yılları arasında toplam 5.690 Gram negatif bakteri izolatı

- ✓ Solunum yolu; %76.5
- ✓ Kan kültürü; %12.1
- ✓ İdrar; %11.4

- *A. baumannii ;* %37.3
- *P. aeruginosa;* %30.3
- *Enterobacter* spp. ; %10.4%,
- *E. coli ;*%10.4%),
- *Klebsiella* spp. ;%8.9

J Infect Dev Ctries 2014; 8(5):597-604.

- MDR *A. baumannii* izolatları;
  - 2004'te %18.7 iken
  - 2011'de %69'a çıkmış ($p < 0.0001$),
- MDR *P. aeruginosa izolatları ise;*
  - %1.5'ten %22'ye çıkmış ($p < 0.0001$).
- Karbapeneme dirençli *Klebsiella* izolatları özellikle 2010 yılında ani artış göstermiş ve %20 civarına çıkmış.
- ESBL-üreten *Enterobacteriaceae* oranı 2011 yılında en yüksek düzeyde;
  - *E. coli'*de %50
  - *Klebsiella* suşlarında *%*80.

Table 4. Comparison of 2004 and 2011 antibiotic resistance of *A. baumannii*

Antibiotic	Resistance (%) 2004	Resistance (%) 2011	p value	OR	95% CI
IMP	21.9	92.9	< 0.0001	0.02	0.04-0.11
MEM	23.4	94.2	< 0.0001	0.02	0.04-0.11
AK	37.5	70.2	< 0.0001	0.26	0.21-0.52
CES	1.6	92.0	< 0.0001	0.00	0.00-0.03
CIP	92.2	98.2	0.021	0.22	0.17-0.68

IMP: imipenem; MEM: meropenem; AK: amikacin; CES: cefoperazone-sulbactam; CIP: ciprofloxacin
Statistical analyses were calculated using EPI-INFO version 3.5.1

Table 5. Comparison of 2004 and 2011 antibiotic resistance of *P. aeruginosa*

Antibiotic	Resistance (%) 2004	Resistance (%) 2011	p value	OR	95% CI
IMP	24.8	48.8	< 0.0001	0.35	0.22-0.39
MEM	24.8	46.1	< 0.0001	0.39	0.42-0.75
TZP	47.8	56.2	0.106	0.71	0.65-1.04
AK	1.9	23.0	< 0.0001	0.07	0.04-0.36
CAZ	33.8	53.0	< 0.0001	0.45	0.48-0.81
CIP	72.0	47.9	< 0.0001	2.79	1.40-2.46

IMP: imipenem; MEM: meropenem; TZP: tazobactam-piperacilin; AK: smikacin; CAZ: ceftazidime; CIP: ciprofloxacin
Statistical analyses were calculated using EPI-INFO version 3.5.1

Rev Bras Anestesiol. 2013;63(1):73-84

ELSEVIER

REVISTA
BRASILEIRA DE
ANESTESIOLOGIA

Official Publication of the Brazilian Society of Anesthesiology
www.sba.com.br/rba/index.asp

SCIENTIFIC ARTICLE

Three-Year Evaluation of Nosocomial Infection Rates of the ICU

Necla Dereli [1], Esra Ozayar [1], Semih Degerli* [1], Saziye Sahin [1], Filiz Koç [2]

1. Anesthesiology and Reanimation Department, Ankara Kecioren Training and Research Hospital, Turkey
2. Infectious Diseases Department, Ankara Kecioren Training and Research Hospital, Turkey
Received from Ankara Kecioren Training and Research Hospital, Turkey.

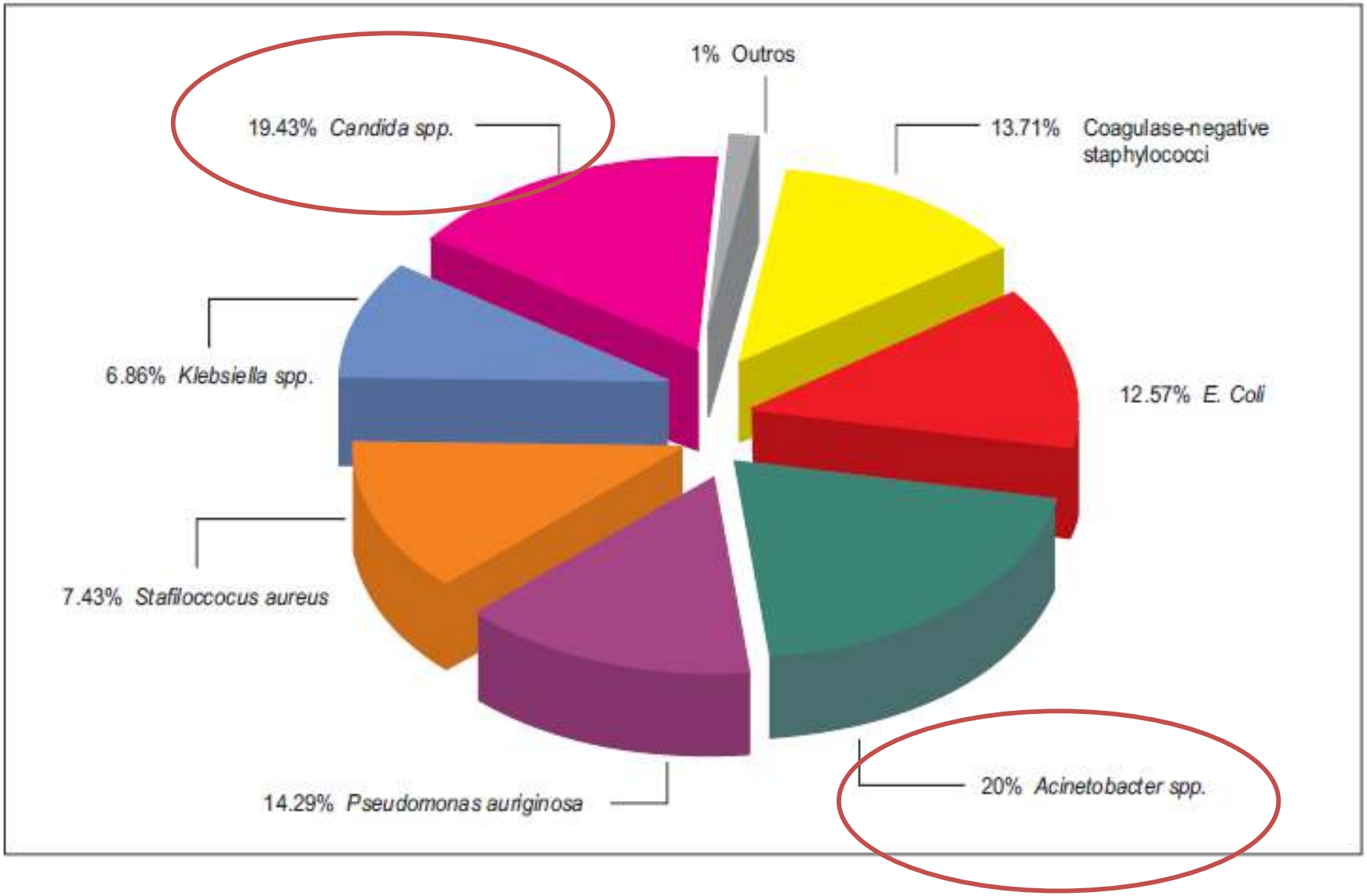
Submitted on December 30, 2011. Approved on March 20, 2012.

Anestezi YBÜ

- 3 (4?)yıllık sürede takip edilen hastalar
- Hİ oranı;
  - 2007'de %53
  - 2008'de %29.15
  - 2009'da %28.85
  - 2010'da %16.62

- En sık saptanan Kan Dolaşımı İnfeksiyonu (KDİ)

- Gram negatifler; % 54.86,
- Gram pozitifler; % 24.55, ,
- *Candida spp.* ; 19.43%.
- *S. aureus'*ların metisilin direnci; %61.54
- E. coli ve Klebsiellalarda ESBL oranı; %48.72.


1% Outros
19.43% Candida spp.
13.71% Coagulase-negative staphylococci
6.86% Klebsiella spp.
12.57% E. Coli
7.43% Stafiloccocus aureus
14.29% Pseudomonas auriginosa
20% Acinetobacter spp.

ANKEM Derg 2014;28(3):86-93
doi:10.5222/ankem.2014.086

Araştırma

KAYSERİ EĞİTİM VE ARAŞTIRMA HASTANESİ DAHİLİYE YOĞUN BAKIM ÜNİTESİ'NDE 2013 YILINDA GELİŞEN HASTANE İNFEKSİYONLARININ DEĞERLENDİRİLMESİ

Funda GÖZÜTOK[1], Fatma MUTLU SARIGÜZEL[2], Berna AYDIN[1], Deniz KAMALAK GÜZEL[1], İnci KILIÇ[1], Saadet GENÇASLAN[1], İlhami ÇELİK[1]

[1]Kayseri Eğitim ve Araştırma Hastanesi, İnfeksiyon Hastalıkları ve Mikrobiyoloji Bölümü, KAYSERİ
[2]Kayseri Eğitim ve Araştırma Hastanesi, Tıbbi Mikrobiyoloji Bölümü, KAYSERİ

- *1.070 hasta, 3.590 hasta günü, 190 hastane infeksiyonu*
- *Hastane infeksiyonu hızı: % 17.7,*
- *Hastane infeksiyonu insidans dansitesi: ‰ 52.9*
- *% 41.5'i Kİ-ÜSİ,*
- *% 27.8'si LK-KDİ,*
- *% 16.8'i SKİ-KDİ*
- *% 11'i VİP*

Tablo 1. Hastane infeksiyonu etkenlerinin spesifik bölgelere göre dağılımı.

Mikroorganizmalar	n (%)	Kİ-ÜSİ	LK-KDİ	SVK-KDİ	VİP	YDİ	NP	CAİ
KNS	43 (22.6)	2	31	10				
S.aureus	9 (4.7)	-	4	3	2			
Enterococcus spp.	31 (16.3)	19	3	8		1	1	
A.baumannii	30 (15.7)	6	3	7	13			
E.coli	29 (15.2)	20	5		3	1		
P.aeruginosa	8 (4.2)	7			1			
K.pneumoniae	6 (3.1)	3		2	1			
E.aerogenes	1	1						
E.cloacae	1		1					
K.oxytoca	1	1						
M.morganii	1		1					1
Maya	30 (15.7)	20	5	2	1	1		1
Toplam etken	190 (100)	79	53	32	21	3		

**Kİ-ÜSİ: Kateter ilişkili üriner sistem infeksiyonu, LK-KDİ: Laboratuvar kanıtlı kan dolaşım infeksiyonu,*
SVK-KDİ: Santral venöz kateter ilişkili kan dolaşımı infeksiyonu, VİP: Ventilatör ilişkili pnömoni
YDİ: Yumuşak doku infeksiyonu, NP: Nozokomiyal pnömoni, CAİ: Cerrahi alan infeksiyonu, KNS: koagülaz negatif stafilokok.

Tablo 2. Gram pozitif bakterilerde antibiyotik direnci (%).

Antibiyotik	KNS n:43	Enterococcus spp. n:31[1]	S.aureus n:9
Vankomisin	0	9.6	0
Teikoplanin	0	9.6	0
Linezolid	0	0	0
Penisilin	95	100	88.8
Eritromisin	83.7	48.3	55.5
Ampisilin	-	58	-
TMP-SMX[2]	22.8	-	33.3
Siprofloksasin	78.3	-	44
Moksifloksasin	43.2	-	44
Gentamisin	47.8	54.5*	33.3
Streptomisin	-	81.8*	-
Klindamisin	68.4	-	33.3

[1]: *31 enterokok suşunun 11'i kandan izole edilmiş, bu suşlarda yüksek düzey gentamisin ve streptomisin direnci bakılmıştır.*
[2]: *TMP-SMX: Trimetoprim-sülfametoksazol.*

Tablo 3. Gram negatif bakterilerde antibiyotik direnci (%).

Antibiyotik	A.baumannii n:30	E.coli n:29	P.aeruginosa n:8	K.pneumoniae n:6
Ampisilin	-	72.4	-	-
AMC[1]	100	68.9	-	50
Seftazidim	96.6	83.3	25	83.3
Seftriakson	100	83.3	-	83.3
Sefepim	96.6	83.3	37.5	66.6
PTZ[2]	100	44.8	50	66.6
Meropenem	96.6	6.8	25	16.6
İmipenem	96.6	6.8	25	16.6
Amikasin	83.3	16.6	25	50
Gentamisin	90	30	25	33.3
Siprofloksasin	100	58.6	25	50
Levofloksasin	100	-	25	-
TMP-SMX[3]	16.6	62	-	50
Kolistin	0	-	0	-
Tigesiklin	8.3	-	-	-

[1]*AMC: Amoksisilin/ klavulanik asit,* [2]*PTZ: Piperasilin/ tazobaktam,*
[3]*TMP-SMX: Trimetoprim-sülfametaksazol.*

KAYSERİ EĞİTİM VE ARAŞTIRMA HASTANESİ
ENFEKSİYON HASTALIKLARI VE KLİNİK MİKROBİYOLOJİ

HASTANEMİZ YOĞUN BAKIM ÜNİTELERİNDE YATAN HASTALARDAN İZOLE EDİLEN MİKROORGANİZMALAR, ANTİBİYOTİK DUYARLILIKLARI VE DİRENÇ PROFİLLERİNİN YILLARA GÖRE DEĞİŞİMİ

TIPTA UZMANLIK TEZİ

Dr. Tuğuba AKYÜREK

KAYSERİ–2016

İzole edilen suşların yoğun bakım ünitelerine göre dağılımı

	Acinetobacter baumanni	E. coli	P. aeruginosa	Klebsiella spp.	Proteus spp.
Anestezi	162 (38,8)	110 (23,6)	70 (15)	49 (10.5)	26 (5,6)
Genel cerrahi	13 (24)	25 (46.3)	9 (16.7)	7 (13)	0 (0.0)
Nöroloji	16 (15.7)	49 (48)	15 (14,7)	20 (19.6)	2 (1.96)
Beyin cerrahi	22 (32,3)	21 (30,1)	15 (22)	7 (10,3)	3 (4,4)
Dahiliye	75 (28)	133 (49,6)	29 (10,8)	14 (5,2)	17 (6,3)
Kardiyoloji	3 (7)	27 (62,8)	8 (18,6)	2(4,6)	3 (7)

İzole edilen suşların enfeksiyon bölgelerine göre dağılımı

	A. baumanni n (%)	*P.aeruginosa* n (%)	*E. coli* n(%)	*Klebsiella* spp. n (%)	*Proteus spp.* n (%)
Kan kültürü	105 (36.1)	31 (21.2)	75 (20.6)	35 (35.4)	14 (27.5)
Yara	13 (4.5)	10 (6.8)	11 (3.0)	4 (4.0)	4 (7.8)
İdrar	32 (21.3)	60 (41.1)	261 (71.7)	45 (45.5)	28 (54.9)
Balgam	0 (0.0)	7 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)
Endotrakeal aspirat	111 (38.1)	38 (26.0)	17 (4.7)	15 (15.2)	5 (9.8)
Toplam	291 (100.0)	146 (100.0)	364 (100.0)	99 (100.0)	51(100.0)

Yıllara göre suşların Meropenem duyarlılığı

Suşlar	2013 n (%)	2014 n (%)	p
Acinetobacter baumanni			
Duyarlı	4 (3.0)	1(0.6)	0.1
Dirençli	131 (97.0)	155 (99.4)	
Pseudomonas aeruginosa			
Duyarlı	42 (53.2)	50 (74.6)	
Dirençli	37 (46.8)	17 (25.4)	0.05
E. coli			
Duyarlı	176 (94.1)	171 (96.1)	
Dirençli	11 (5.9)	7 (3.9)	0.4
Klebsiella spp.			
Duyarlı	34 (64.2)	20 (43.5)	
Dirençli	19 (35.8)	26 (56.6)	0.04
Proteus spp			
Duyarlı	20 (90.9)	28 (96.6)	
Dirençli	2 (9.1)	1 (3.1)	0.4

Yıllara göre suşların İmipenem duyarlılığı

Suşlar	2013 n (%)	2014 n (%)	p
Acinetobacter baumanni			
Duyarlı	4 (3.0)	1 (0.6)	
Dirençli	131 (97.0)	155 (99.4)	0.128
Pseudomonas aeruginosa			
Duyarlı	42 (53.2)	50 (74.6)	
Dirençli	37 (46.8)	17 (25.4)	0.007
E. coli			
Duyarlı	176 (94.1)	171 (96.1)	
Dirençli	11 (5.9)	7 (3.9)	0.390
Klebsiella spp.			
Duyarlı	33 (62.3)	20 (43.5)	
Dirençli	20 (37.7)	26 (56.5)	0.039
Proteus spp.			
Duyarlı	20 (90.9)	26 (89.7)	
Dirençli	2 (9.1)	3 (10.3)	0.396

Yıllara göre suşların Kolistin duyarlılığı

Suşlar	2013 n (%)	2014 n (%)	p
Acinetobacter baumanni			
Duyarlı	130 (100.0)	155 (99.4)	0.4
Dirençli	0 (0.0)	1 (0.6)	
Pseudomonas aeruginosa			
Duyarlı	74 (96.1)	67 (100.0)	0.1
Dirençli	3 (3.9)	0 (0.0)	
E. coli			
Duyarlı	187 (100.0)	178 (100.0)	0.3
Dirençli	0 (0.0)	0 (0.0)	

Yıllara göre suşların Ertapenem duyarlılığı

Suşlar	2013 n (%)	2014 n (%)	p
E. coli			
Duyarlı	179 (95.7)	170 (96.0)	0.9
Dirençli	8 (4.3)	7 (4.0)	
Klebsiella spp.			
Duyarlı	32 (60.4)	14 (30.4)	0.005
Dirençli	21 (39.6)	32 (69.6)	
Proteus spp.			
Duyarlı	19 (86.4)	27 (93.1)	0.4
Dirençli	3 (13.6)	2 (6.9)	

2015-2016 Yılları Hastanemiz YBÜ Verileri

YBÜ	A. baumanni n (%)	Candida spp. n (%)	Klebsiella spp. n (%)	Enterekok spp. n (%)	P. aeruginos n (%)	E.Coli n (%)	KNS n (%)	S. aureus n (%)
Anestezi YBÜ	175 (51.4)	58 (36.2)	65 (50.8)	44 (47.8)	34 (47.9)	12 (28.6)	7 (18.4)	5 (31.3)
Beyin Cerrahi YBÜ	38 (11.2)	15 (9.4)	14 (10.9)	10 (10.9)	9 (12.7)	7 (16.7)	3 (7.9)	1 (6.2)
Dâhiliye YBÜ	56 (16.4)	28 (17.4)	17 (13.3)	11 (12.0)	9 (12.7)	5 (11.9)	7 (18.4)	5 (31.3)
Genel Cerrahi YBÜ	8 (2.4)	11 (6.9)	2 (1.6)	4 (4.3)	0 (0)	1 (2.4)	0 (0)	0 (0)
Kalp Damar Cerrahi YBÜ	4 (1.2)	7 (4.4)	1 (0.8)	1 (1.1)	0 (0)	0 (0)	0 (0)	0 (0)
Kardiyoloji YBÜ	7 (2.1)	10 (6.3)	5 (3.9)	4 (4.3)	8 (11.2)	3 (7.1)	8 (21.1)	4 (25.0)
Nöroloji YBÜ	51 (15.0)	27 (16.9)	24 (18.7)	18 (19.6)	11 (15.5)	14 (33.3)	13 (34.2)	0 (0)
Yanık YBÜ	1 (0.3)	4 (2.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6.2)
Toplam	340 (100)	160 (100)	128 (100)	92 (100)	71 (100)	42 (100)	38 (100)	16 (100)

2016 Anestezi YBÜ

İzole edilen candida türleri	Oran (%)
C. albicans	45.6
C. parapsilosus complex	24.6
C. glabrata	10.5
C. tropicalis	10.5
Candida spp.	8.8

Antibiyotik	Acinetobacter baumannii	Klebsiella pneumoniae	Pseudomanas aeruginosa	E. coli	Enterekok spp.	KNS	Stafilakok aureus
	Dirençli %	Dirençli %	Dirençli %	Dirençli %	Dirençli %	Dirençli %	Dirençli %
Amikasin	92.8	25	26	0	-	100	100
Ampicilin	100	97.1	-	66.7	47.8	-	-
Ampicilin-Sulbaktam	94.1	92.6	50	90.9	33.3	85.7	100
Aztreonam	100	83.4	77.1	66.7	-		-
Daptomisin	-	-	-	-	-	8.3	33.3
Gentamisin	78.5	51.7	18.1	27	61.1	69	71.4
İmipenem	96.9	81.7	53.7	5.6	-	-	-
Kolistin	2.5	22,5	0	-	-	-	-
Levofloksasin	96.5	80.8	30.8	-	27.3	-	25
Linezoid	-	-	-	-	14.3	14.3	33.3
Meropenem	97.7	71.2	39.4	12.5	-	-	-
Methicilin	-	-	-	-	-	85.8	76.9
Netilmisin	94.3	65	54.5	80	-	-	-
Piperasilin-Tazobaktam	93.1	88.9	33.3	40	-	-	-
Sefepim	96.3	87	36	76.5	-	-	-
Seftazidim	95.1	75	30.9	0	-	-	-
Seftriakson	100	82.3	0	84.2	-	-	-
Siprofloksasin	96.5	76	35.4	-	57.7	83.3	60
Teikoplanin	-	-	-	-	17.1	13.3	50
Tigesiklin	100	-	-	-	14.3	-	-
Trimetoprim-Sulfametaksozol	80	62	50	61.3	-	25	9.1
Vankomisin	-	-	-	-	15.7	0	10

Karbapenem Direnci

Karbapenem Direnci	2015	2016
	Dirençli n (%)	Dirençli n (%)
Acinetobacter baumanni (n=340)	41	88
Klebsiella pneumoniae (n=124)	13	29
Pseudomonas aeruginosa (n=67)	7	9
Enterobacter spp. (n=26)	4	4
Pseudomonas spp. (n=4)	0	1

Kolistin Direnci

Kolistin	2015 Yılı		2016 Yılı	
	Duyarlı n (%)	Dirençli n (%)	Duyarlı n (%)	Dirençli n (%)
***Acinetobacter baumanni* (n=340)**	164 (98.2)	3 (1.8)	133 (97.8)	3 (2.2)
Klebsiella pneumoniae				%31

Antibiyotik	Acinetobacter baumannii	Klebsiella pneumoniae	Pseudomanas aeruginosa	E. coli	Enterekok spp.	KNS	Stafilakok aureus
	Dirençli %	Dirençli %	Dirençli %	Dirençli %	Dirençli %	Dirençli %	Dirençli %
Amikasin	92.8	25	26	0	-	100	100
Ampicilin	100	97.1	-	66.7	47.8	-	-
Ampicilin-Sulbaktam	94.1	92.6	50	90.9	33.3	85.7	100
Aztreonam	100	83.4	77.1	66.7	-		-
Daptomisin	-	-	-	-	-	8.3	33.3
Gentamisin	78.5	51.7	18.1	27	61.1	69	71.4
İmipenem	96.9	81.7	53.7	5.6	-	-	-
Kolistin	2.5	22.5	0	-	-	-	-
Levofloksasin	96.5	80.8	30.8	-	27.3	-	25
Linezoid	-	-	-	-	14.3	14.3	33.3
Meropenem	97.7	71.2	39.4	12.5	-	-	-
Methicilin	-	-	-	-	-	85.8	76.9
Netilmisin	94.3	65	54.5	80	-	-	-
Piperasilin-Tazobaktam	93.1	88.9	33.3	40	-	-	-
Sefepim	96.3	87	36	76.5	-	-	-
Seftazidim	95.1	75	30.9	0	-	-	-
Seftriakson	100	82.3	0	84.2	-	-	-
Siprofloksasin	96.5	76	35.4	-	57.7	83.3	60
Teikoplanin	-	-	-	-	17.1	13.3	50
Tigesiklin	100	-	-	-	14.3	-	-
Trimetoprim-Sulfametaksozol	80	62	50	61.3	-	25	9.1
Vankomisin	-	-	-	-	15.7	0	10

Dissemination of the mcr-1 colistin resistance gene

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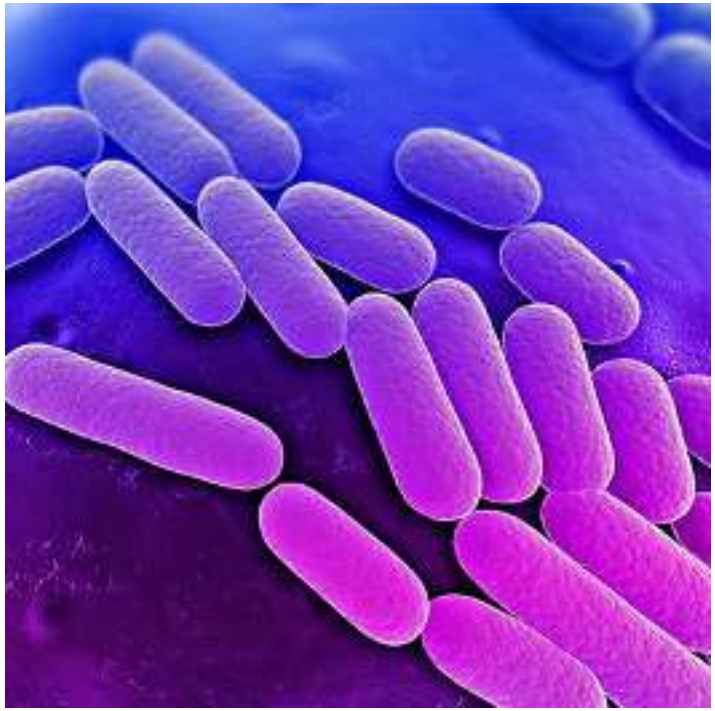

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Colistin resistance in Carbapenem-resistant *Klebsiella pneumoniae* strains.

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Abstract

Objective: Because of the increase in the infections caused by carbapenem-resistant Klebsiella pneumoniae carbapenemase (KPC)-producing *K. pneumoniae* ; nowadays colistin is used more frequently. In this study, the firstly detected colistin resistance in carbapenem-resistant KPC-producing *K. pneumoniae* strains were evaluated.

Material and methods: For identification and susceptibility testing: VITEK 2 Compact (bioMérieux, France) have been used. Because of resistance; MICs were studied with gradient test method in Microbiology Reference Laboratory, Public Health Institution of Turkey, Ministry of Health, Ankara, Turkey for confirmation. The presence of carbapenem resistance genes (OXA23, NDM1, OXA48, KPC, VIM ve IMP) was investigated by Polymerase Chain Reaction (PCR) method. Pulsed Field Gel Electrophoresis (PFGE) method was used to determine the clonal relationships between strains. PCR and PFGE tests have been studied in Molecular Microbiology Research and Application Laboratory Department of Microbiology Reference Laboratories, Public Health Institution of Turkey, Ministry of Health, Ankara, Turkey.

Results: All strains were resistance for carbapenems and colistin Two of four strains were isolated from patients hospitalized in intensive care and two of them were isolated from patients hospitalized in clinics. Resistance to carbapenems were confirmed genotypically. Two strains isolated from patients in clinics were positive for NDM1 and OX-48, and isolates from patients in intensive care unit were positive for only OXA-48 carbapenem genes. PFGE typing method described two clones that have a relationship with each other. The strains in which NDM1 and OXA-48 were together positive were in one clone and OXA-48-positive strains were in other clone.

Conclusion: The emergence of colistin resistant strains is a very important problem due to decrease of treatment options for infections caused by carbapenem-resistant KPC producing *K. pneumoniae*. Colistin should not be used alone, combination therapy should be preferred.

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Chlorhexidine Linked to Colistin Resistance