Ülkemiz ve Dünyadaki Direnç Durumu Nedir?

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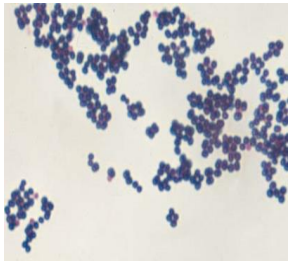
İnfeksiyon Hast ve Klinik Mikrobiyoloji Kliniği

Diyabetik hastalarda;

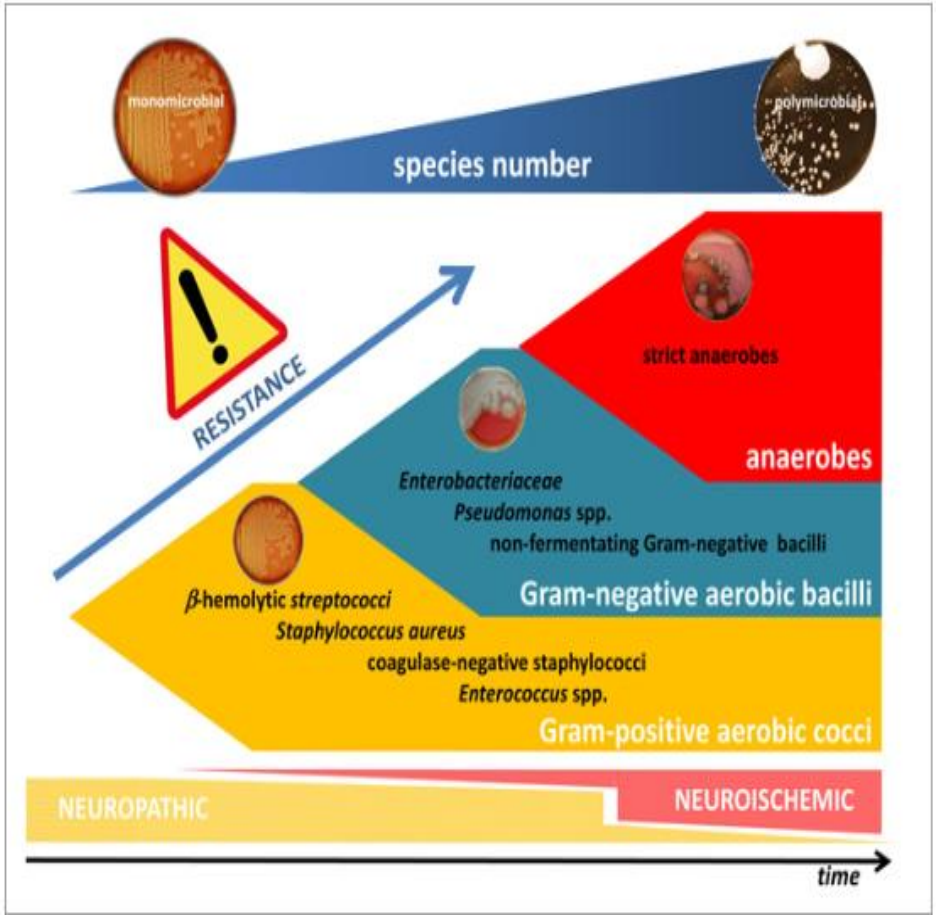
- Hastane başvurularının en az %20'sinin nedeni ayak ülser ve infeksiyonlar
- Ülser ve infeksiyonlar morbidite, mortalite, travmatik olmayan ayak amputasyonlarının en sık nedeni

DAİ etken mikroorganizmalar

- Hastanın özelliklerine
  - Eşlik eden hastalıklar (KBY, malignensi, immünsupresyon..)
  - 30 gün öncesinde antibiyotik kullanımı
  - Son 3 ay içinde hastaneye yatış öyküsü
  - Bakım merkezinde kalma
- Yaranın klinik durumuna
- Bölgesel epidemiyolojik verilere göre değişir.



- Nöropati başlangıcı ve akut dönemde monomikrobiyal
- Kronik ve uzun süren yaralarda polimikrobiyal



Ayak infeksiyonu	Patojen
Açık yara olmaksızın selülit	Beta hemolitik streptokoklar, *S.aureus*
İnfekte ülser	*S.aureus*, beta hemolitik streptokok
Kronik enfekte ülser, öncesinde antibiyotik kullanımı	*S.aureus*, beta hemolitik streptokok, *Enterobacteriacea spp.*
Geniş spektrumlu AB tedavisine rağmen iyileşmeyen yara	*S.aureus*, KNS, Enterokok, Difteroid basiller, *Enterobacteriacea spp.* *Pseudomonas spp.* nonfermentatif Gr(-) basiller, mantarlar
Gangrene, nekrozlu, yara	Polimikrobiyal, aerobik Gram (+) koklar (enterokok dahil), *Enterobacteriacea spp.* NFGB, zorunlu anaeroblar

Lipsky BA et al. CID 2004;39(7):895-904

Diyabetik ayak infeksiyonu antimikrobiyal tedavi

- Kültür sonucu çıkana kadar empirik
- Antibiyotik seçimi
  - Hastanın özellikleri
  - Yaranın durumu
  - Dirençli bakterileriler için risk faktörleri (MRSA, GSBL gibi)
  - Epidemiyolojik özellikler

Antibiyotik direnci

MDR (Çoklu direnç)

3 veya daha fazla antibiyotik sınıfına direnç

Extensive (XDR) ilaç direnci:

≤2 antibiyotik sınıfına duyarlılık

PDR (pan drug resistance)

Tüm antibiyotiklere direnç (kolistin dahil) olarak tanımlanır.

Clin Microbiol Infect 2012; 18:268–281

ESCAPE

- *Enterococcus faecium*
- *Staphylococcus aureus*
- *Klebsiella pneumoniae*
- *Acinetobacter baumannii*
- *Pseudomonas aeruginosa*
- *Enterobacter spp.*

MMWR Weekly
July 5, 2002 / 51(26);565-567

Staphylococcus aureus Resistant to Vancomycin --- United States, 2002

Staphylococcus aureus is a cause of hospital- and community-acquired infections (*1,2*). In 1996, the first clinical isolate of *S. aureus* with reduced susceptibility to vancomycin was reported from Japan (*3*). The vancomycin minimum inhibitory concentration (MIC) result reported for this isolate was in the intermediate range (vancomycin MIC=8 µg/mL) using interpretive criteria defined by the National Committee for Clinical Laboratory Standards (*4*). As of June 2002, eight patients with clinical infections caused by vancomycin-intermediate *S. aureus* (VISA) have been confirmed in the United States (*5,6*). This report describes the first documented case of infection caused by vancomycin-resistant *S. aureus* (VRSA) (vancomycin MIC ≥32 µg/mL) in a patient in the United States. The emergence of VRSA underscores the need for programs to prevent the spread of antimicrobial-resistant microorganisms and control the use of anti-microbial drugs in health-care settings.

In June 2002, VRSA was isolated from a swab obtained from a catheter exit site from a Michigan resident aged 40 years with diabetes, peripheral vascular disease, and chronic renal failure. The patient received dialysis at an outpatient facility (dialysis center A). Since April 2001, the patient had been treated for chronic foot ulcerations with multiple courses of antimicrobial therapy, some of which included vancomycin. In April 2002, the patient underwent amputation of a gangrenous toe and subsequently developed methicillin-resistant *S. aureus* bacteremia caused by an infected arteriovenous hemodialysis graft. The infection was treated with vancomycin, rifampin, and removal of the infected graft. In June, the patient developed a suspected catheter exit-site infection, and the temporary dialysis catheter was removed; cultures of the exit site and catheter tip subsequently grew *S. aureus* resistant to oxacillin (MIC >16 µg/mL) and vancomycin (MIC >128 µg/mL). A week after catheter removal, the exit site appeared healed; however, the patient's chronic foot ulcer appeared infected. VRSA, vancomycin-resistant *Enterococcus faecalis* (VRE), and *Klebsiella oxytoca* also were recovered from a culture of the ulcer. Swab cultures of the patient's healed catheter exit site and anterior nares did not grow VRSA. To date, the patient is clinically stable, and the infection is responding to outpatient treatment consisting of aggressive wound care and systemic antimicrobial therapy with trimethroprim/sulfamethoxazole.

Ülkemiz verileri

Risk factors for infection of the diabetic foot with multi-antibiotic resistant microorganisms

- 2002 ve 2005 yılları
- 102 hasta

  73 hastada 104 izolat

  42 izolat (%40.4) MDR

- **Etkenler**

S.aureus % 29.8

E.coli % 20.1

Pseudomonas spp. % 19.2

Table 1 Isolated bacteria and resistance distribution in patients with diabetic foot

Agent	Resistance (MDRM)		Total (%)
	Positive (%)	Negative (%)	
Gram positive			
S. aureus	24 (77.5)	7 (22.5)	31 (29.8)
Coagulase negative staphylococci	1 (20)	4 (80)	5 (4.8)
Enterococcus spp	0 (0)	8 (100)	8 (7.6)
Group B beta haemolytic streptococci	0 (0)	1 (100)	1 (0.9)
Gram negative			
E. coli	6 (28.5)	15 (71.5)	21 (20.1)
Pseudomonas spp	9 (45)	11 (55)	20 (19.2)
Acinetobacter spp	0 (0)	7 (100)	7 (6.7)
Proteus spp	2 (50)	2 (50)	4 (3.8)
Enterobacter spp	0 (0)	3 (100)	3 (2.8)
Morganella morganii	0 (0)	2 (100)	2 (1.9)
Anaerobic bacteria	0 (0)	2 (100)	2 (1.9)
Total	42	62	104

Kandemir Ö et al. J of Infection 2007;54: 439-45.

Table 2 Distribution of risk factors according to the groups regarding MDRM acquisition in infected diabetic foot

Variable	No growth $n = 29$	MDRM+ $n = 36$	MDRM− $n = 37$	Total $n = 102$	p
Age (years)	61 ± 12	59 ± 10	60 ± 10	60 ± 11	0.83
Male gender	14	22	23	59	0.99
Female gender	15	14	14	43	0.78
HbA1c (%)	7.6 ± 1.8	8.1 ± 2.1	8 ± 2.2	7.9 ± 2.1	0.67
Diabetes duration (years)	14 ± 8	12 ± 6	12 ± 8	13 ± 7	0.73
Nephropathy (%)	6 (20.7)	8 (22.2)	8 (21.6)	22 (21.6)	0.98
Neuropathy (%)	26 (89.7)	36 (100)	33 (89.2)	95 (93.1)	0.41
Wound (days)	58 ± 91	180 ± 542	113 ± 199	121 ± 347	0.32
Hospitalisation duration (day)	8 ± 10	37 ± 29	20 ± 19	23 ± 24	0.00
Hospitalisation prevalence	0.8 ± 1.0	2.3 ± 1.1	1.5 ± 1.1	1.6 ± 1.2	0.00
Neuro-ischemic ulcer (%)	11(37.9)	24 (66.7)	20 (54.1)	55 (53.9)	0.06
Antibiotherapy(+) (%)	28 (96.6)	36 (100)	29 (78.4)	93 (91)	0.002
Antibioterapy (−) (%)	1 (11.1)	0 (0)	8 (88.8)	9 (9)	

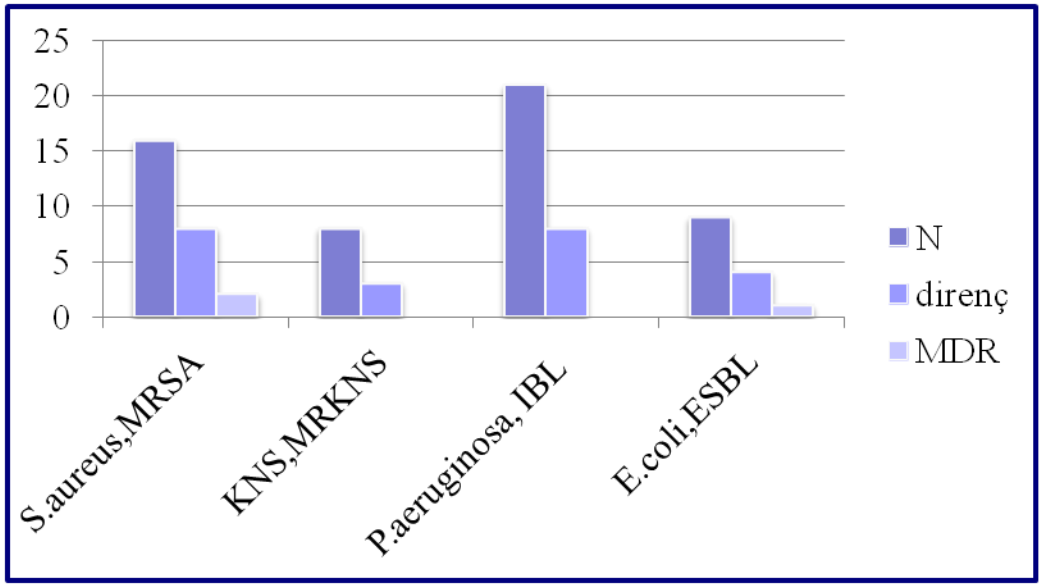
Kandemir Ö et al. J Infection 2007;54: 439-45.

A prospective, multi-center study: factors related to the management of diabetic foot infections

Gram-positive aerobic cocci	55 (47.8)
Staphylococcus aureus	16 (13.9)
Methicillin-resistant	8
Multidrug-resistant	2
Coagulase-negative staphylococcus	8 (6.9)
Methicillin-resistant	3
Streptococcus spp.	17 (14.8)
Enterococcus spp.	14 (12.2)
Betalactam-resistant	1
Gram-negative aerobic bacilli	55 (47.8)
Pseudomonas aeruginosa	21(18.4)
IBL[a] positive	8
Escherichia coli	9 (7.8)
ESBL[b] positive	4
Multidrug-resistant	1
Proteus spp.	8 (6.9)
ESBL[b] positive	1
Morganella spp.	8 (6.9)
Multidrug-resistant	3
Klebsiella pneumonia	3 (2.6)
ESBL[b] positive	2
Acinetobacter spp.	3 (2.6)
Multidrug-resistant	3
Enterobacter spp.	3 (2.6)
ESBL[b] positive	2
Other (including anaerobes)	5 (4.4)
Total	115 (100)
Total resistant bacteria	38 (33)

- *P.aeruginosa* 21 (%18.4)
- *Streptococcus spp.* 17 (%14.8)
- *S.aureus* 16 (%13.9)
- *Enterobacteriacea spp.* 31

Ertuğrul B et al. Eur J Clin Microbiol Infect Dis 2012; 31:2345–2352



Direnç

İBL (+) %38

MRSA %50

GSBL (+) %29

Dirençli bakteri risk faktörü

- Önceki amputasyon
- Son 30 gün içinde AB kullanılması

Ertuğrul B et al. Eur J Clin Microbiol Infect Dis 2012; 31:2345–2352

Increasing incidence of Gram-negative organisms in bacterial agents isolated from diabetic foot ulcers

- 2005-2010 yılları

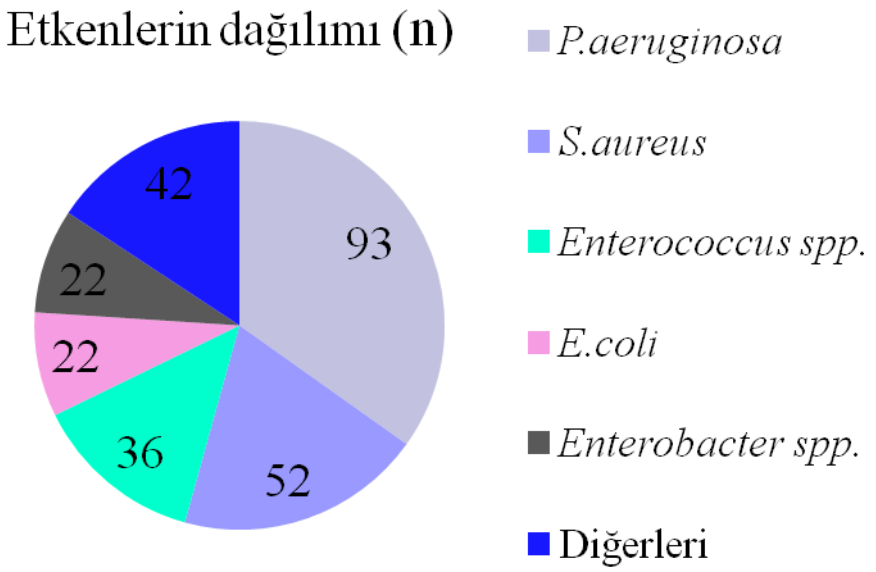
  107 hasta,

  298 kültür (1.16 /kültür)

  267 üreme

  %16 (44) polimikrobiyal

- Gram (-) bakteri %61.3 (191)
- Gram (+) bakteri %38.7 (121)



Turhan V et al. J Infect Dev Ctries 2013; 7(10):707-712

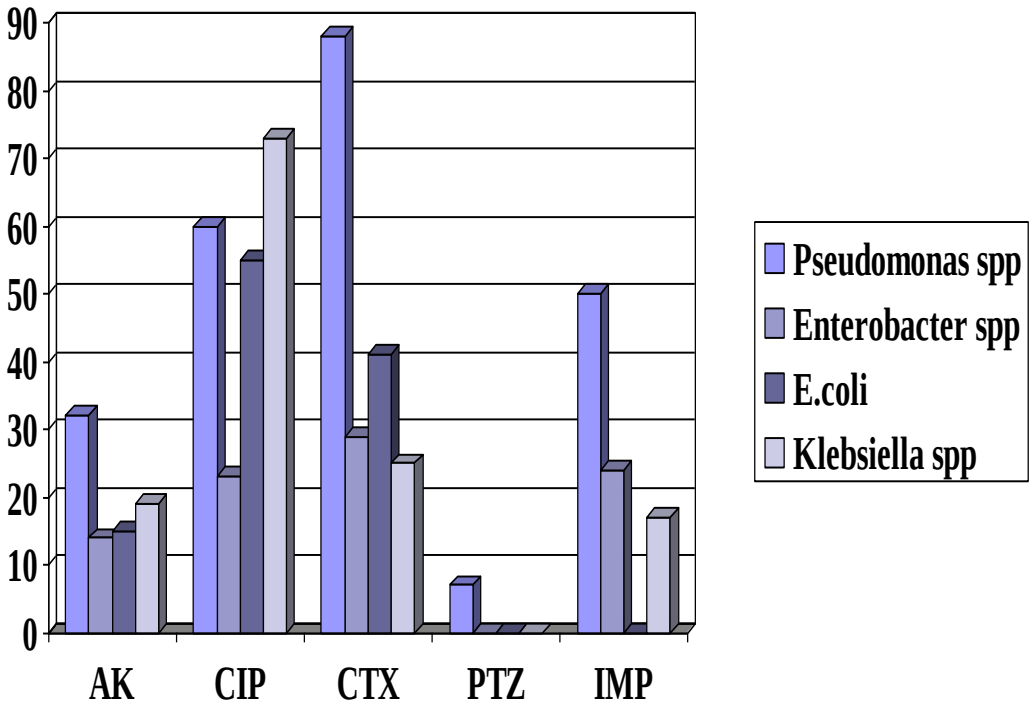
Table 2. Percentage of in vitro susceptibility of Gram-positive aerobic organisms to antimicrobials (%)[a]

Bacteria	CIP	SAM	SXT	VA	MET	LNZ	FA	TE	P	E	LEV
Staphylococcus aureus (MS)	71	100	50	100	100	100	100	72	48	71	95
Staphylococcus aureus (MR)	35	50	56	100	0	90	100	55	13	34	0
Enterococcus spp.	30	90	26	97	9	93	61	11	79	19	60
Staphylococcus (coagulase negative)	28	50	61	100	12	93	100	28	20	25	57
Micrococcus spp.	33	20	60	100	50	100	80	50	37	25	0
Streptococcus spp.	50	40	40	100	16	83	60	0	25	50	100

- *S.aureus*'ta metisilin direnci %44.2,
- 1 *E. faecalis* izolatı vankomisin dirençli

Turhan V et al. J Infect Dev Ctries 2013; 7(10):707-712

Direnç oranları



IBL pozitifliği

P. aeruginosa %32.2,

Enterobactericeae spp %17.6

GSBL pozitifliği:

2 *Escherichia coli*

1 *Klebsiella oxytoca*

Turhan V et al. J Infect Dev Ctries 2013; 7(10):707-712

The microbiologic profile of diabetic foot infections in Turkey: a 20-year systematic review

Diabetic foot infections in Turkey

- 1989-2011 vaka serileri, prospektif ve retrospektif çalışmalar
- 1989-2011 ile 2007-2011 dönemleri karşılaştırılmış.
- 31 çalışma (12 si prospektif, diğerleri retrospektif)
- 2097 hastadan 1974 izolat elde edilmiş.

Hatipoğlu M et al. Eur J Clin Microbiol Infect Dis 2014

Table 2 Pooled rates of microorganisms assessed between 1989 and 2011 and between 2007 and 2011

Microorganisms	1989–2011	2007–2011
Aerobic gram-positives		
Staphylococcus aureus	23.8	19.1
MRSA	7.8	5.7
Enterococcus spp.	8.6	10.4
Staphylococcus (coagulase negative)	8.9	10.0
Streptococcus spp.	6.5	7.3
Other gram-positives	1.0	2.0
Total gram-positives	48.7	48.8
Escherichia coli	12.5	12.0
Klebsiella spp.	6.5	7.0
Proteus spp.	5.3	5.0
Enterobacter spp.	4.0	4.5
P. aeruginosa.	13.7	14.9
Acinetobacter spp.	1.9	1.8
Other Gram-negatives	4.6	4.8
Total gram-negative	48.4	49.9
Obligate anaerobes	2.3	0.9
Fungus	0.5	0.4

Hatipoğlu M et al. Eur J Clin Microbiol Infect Dis 2014

Table 3 Percentage of in vitro susceptibility to selected antibiotic agents of gram-positive aerobic isolates from diabetic foot infections

Antibiotic	*Staphylococcus aureus*			*Enterococcus* spp.			*Staphylococcus* (coagulase negative)			*Streptococcus* spp.		
	n	*T*	%	*n*	*T*	%	*n*	*T*	%	*n*	*T*	%
Oxacillin	85	133	63.9				15	29	51.7	8	8	100
Methicillin	9	21	42.9				2	9	22.2	5	13	38.5
Penicillin	8	102	7.8	21	50	42	8	29	27.6	29	38	76.3
Ampicillin	2	54	3.7	23	25	92	0	2	0.0	14	16	87.5
Vancomycin	168	168	100	66	74	89.2	38	38	100	37	37	100
Teicoplanin	80	80	100	33	43	76.7	38	38	100	20	20	100
Linezolid	85	85	100	43	43	100	31	31	100	18	18	100
Ciprofloxacin	118	165	71.5	53	68	77.9	23	36	63.9	31	35	88.6
Levofloxacin	12	25	48							8	8	100
Trimethoprim-sulfamethoxazole	117	139	84.2	11	29	37.9	17	38	44.7	16	21	76.2
Rifampicin	47	73	64.4	24	33	72.7	27	29	93.1	26	28	92.9
Fusidic acid	60	65	92.3	12	16	75	23	29	79.3	7	10	70
Ampicillin/sulbactam	55	82	67.1	32	35	91.4	29	33	87.9	17	22	77.3
Tetracycline	49	91	53.8	13	40	32.5	28	29	96.6	18	24	75
Erythromycin	81	136	59.6	8	33	24.2	25	35	71.4	26	41	63.4
Clindamycin	109	147	74.1	19	39	48.7	33	35	94.3	29	33	87.9

(n:duyarlı izolat sayısı:,T: test edilen total izolat sayısı:)

Hatipoğlu M et al. Eur J Clin Microbiol Infect Dis 2014

Table 4 Percentage of in vitro susceptibility to selected antibiotic agents of gram-negative aerobic isolates from diabetic foot infections

Antibiotic	Escherichia coli			*Klebsiella* spp.			*Proteus* spp.			*Enterobacter* spp.			*P. aeruginosa*			*Acinetobacter* spp.		
	n	*T*	%	*n*	*T*	%	*n*	*T*	%	*n*	*T*	%	*n*	*T*	%	*n*	*T*	%
Amikacin	32	39	82.1	32	32	100	14	14	100	19	19	100	63	67	94	7	9	77.8
Aztreonam				3	4	75	4	4	100	3	3	100	3	6	50	2	2	100
Cefepime	42	56	75	24	32	75	10	10	100	15	19	78.9	43	53	81.1	5	9	55.6
Cefoperazone-sulbactam	47	56	83.9	25	32	78.1	10	10	100	19	19	100	39	45	86.7	7	7	100
Ceftazidime	44	56	78.6	27	32	84.4	10	10	100	16	19	84.2	57	67	85.1	4	9	44.4
Cefotaxime	21	22	95.5	5	6	83.3	5	5	100	10	11	90.9						
Ciprofloxacin	29	56	51.8	26	32	81.3	14	14	100	18	19	94.7	52	67	77.6	5	11	45.5
Gentamicin	11	34	32.4	13	26	50	8	9	88.9	8	10	80	23	42	54.8	5	8	62.5
Imipenem	47	47	100	24	24	100	7	7	100	16	16	100	57	58	98.3	10	11	90.9
Levofloxacin	6	8	75	6	6	100	3	3	100	3	3	100	18	24	75	3	8	37.5
Trimethoprim-sulfamethoxazole	27	56	48.2	17	32	53.1	8	11	72.7	13	17	76.5	2	18	11.1			
Piperacillin/tazobactam/	48	56	85.7	24	32	75	8	10	80	17	19	89.5	54	59	91.5	7	11	63.6
Ampicillin	3	26	11.5	1	14	7.14	5	9	55.6									
Ampicillin-sulbactam	12	22	54.5	4	8	50	2	4	50	6	11	54.5	8	18	44.4	3	3	100

Hatipoğlu M et al. Eur J Clin Microbiol Infect Dis 2014

ORIGINAL ARTICLE INFECTIOUS DISEASES

Predictors for limb loss among patient with diabetic foot infections: an observational retrospective multicentric study in Turkey

N. Saltoglu[1], M. Yemisen[1], O. Ergonul[2], A. Kadanali[3], G. Karagoz[3], A. Batirel[4], O. Ak[4], H. Eraksoy[5], A. Cagatay[5], A. Vatan[1], G. Sengoz[6], F. Pehlivanoglu[6], T. Aslan[7], Y. Akkoyunlu[7], D. Engin[8], N. Ceran[8], B. Erturk[9], L. Mulazimoglu[9], O. Oncul[10], H. Ay[10], F. Sargin[11], N. Ozgunes[11], F. Simsek[12], T. Yildirmak[12], N. Tuna[13], O. Karabay[13], K. Yasar[14], N. Uzun[15], Y. Kucukardali[16], M. Sonmezoglu[16], F. Yilmaz[11], U. Tozalgan[17], S. Ozer[4] and M. Ozyazar[1], KLIMIK Turkish Society, Diabetic Foot Study Group

- 17 merkez, 2011-2013,

  Gram (-) bakteriler %54.8

- ✓ ***P.aeruginosa*** **36 (%17.3)**
- ✓ *E.coli* 30 (%14.4)
- ✓ *Enterobacter spp.* 11(%5.3)
- ✓ **ESBL enterobacteriacea**

  10 (%19.6)

455 hasta, 208 mikroorganizma

Gram(+) bakteriler %44.2

- ✓ **MSSA 37(%17.8)**
- ✓ **MRSA 11(%5.3)**
- ✓ MRKNS 18 (8.6)
- ✓ *Streptococcus spp.* 14 (%6.7)
- ✓ *Enterococcus spp.*12 (%5.8)

Clin Microbiol Infect 2015; 21:659-65.

Contents lists available at ScienceDirect

Journal of Diabetes and Its Complications

journal homepage: WWW.JDCJOURNAL.COM

Causative pathogens and antibiotic resistance in diabetic foot infections: A prospective multi-center study

- 35 merkez, 447 hasta,
  387 izolat
- **Gram(+) bakteriler** **%36.4**
  - *S. aureus* %11.4
  - *Enterococcus spp* %10
- **Direnç**
  - **MRSA** **< %2**
  - Teikoplanin %1.2
  - Vankomisin %0.9
  - Linezolid %4.3

- **Gram (-) bakteriler** **%60.2**
  - *E. coli* %15
  - *P.aeruginosa* *%12.4*
  - *Proteus spp.* %9.6
- **Direnç**
  - Meropenem %9.4
  - İmipenem %9.7
  - PTZ %16.6
  - CFS %16.7

Hatipoğlu M et al. J of Diabetes and Its Complications 2016

Türkiye DAİ etken ve direnç

Çalışmacı Yayın yılı	İzolat N	Gram (+) %	Gram (-) %	Anaerob	İlk 2 etken (%)	Direnç (%) (MRSA, GSBL, IBL)
Kandemir et al 2007	104	43.3	54.8	1.9	*S.aureus* (29.8) *E.coli* (20.1)	**MDR (35.2)**
Saltoğlu et al, 2010	89	43	57		MRKNS (16.9) *P.aeruginosa* (14.6)	
Ertuğrul et al. 2012	115	47.8	47.8	4.4	*P.aeruginosa* (18.4) *Streptococcus spp. (14.8))*	**MRSA (50)** **GSBL (29)** **IBL(38)**
Turhan et al. 2013	312	38.7	61.3		*P.aeruginosa* (34.8) *Staphylococcus* spp. (19.5)	**MRSA (44.2)** **VRE (3)** **IBL (17.6-32.2)**
Hatipoğlu et al. 2014	1974	48.7	48.4	2.3	*S.aureus*(23.8) *P.aeruginosa* (13.7)	
Saltoğlu et al, 2015	208	44.2	54.8		*S.aureus* (17.8) *P. aeruginosa* (17.3)	**MRSA(5.3)** **GSBL (19.6)**
Hatipoğlu et al, 2016	522	36.4	60.2		*E. coli (* 15) *P .aeruginosa* (12.4)	**MRSA<%2**

DAİ Etkenleri ve Direnç Dünyadaki Durum

Bacteriology of Moderate-to-Severe Diabetic Foot Infections and In Vitro Activity of Antimicrobial Agents[▽]

- 2001-2004 yılları, ABD'de prospektif çok merkezli
- 433 hasta, 454 örnek
- 1607 izolat : 1145 aerobik, 462'si anaerobik
- %83.8 polimikrobiyal

	N	%
Gram pozitif	**920**	**80.3**
Staphyloccus spp.	389	34
Streptococcus spp.	177	15.5
Enterococcus spp.	155	13.5
Gram negatif	**225**	**19.7**
Anaerob bakteriler	**462**	
Anaerobik koklar	209	45.2

Citron DM et al. J of Clin Microbiol 2007;2819-28

Etiological Factors of Infections in Diabetic Foot Syndrome – Attempt to Define Optimal Empirical Therapy

- 2008-2010, Polonya
- 102 hasta, 199 bakteri

E. faecalis **%16**

S.aureus **%15.5**

KNS %11

P.aeruginosa *%7.5*

P.mirabilis %7.5

MRSA **%6.5**

GSBL **%22.2**

Table 1. Percentage distribution of cultured microorganisms

Bacterium	N	%	Comments
Enterococcus faecalis	32	16.08	10 HLAR
Staphylococcus aureus	31	15.58	27 MSSA, 2 MRSA (including 2 alert)
Staphylococci coagulase-negative	22	11.05	MRCNS, MSCNS, *Staphylococcus epidermidis, carnosus, simulans, lentus, haemoliticus, capitis*
Pseudomonas aeruginosa	15	7.54	
Proteus mirabilis	15	7.54	
Escherichia coli	14	7.04	2 alert ESBL
Enterobacter cloacae	10	5.03	1 alert ESBL
Klebsiella oxytoca	7	3.52	
Streptococcus pyogenes	6	3.02	
Serratia marcescens	4	2.01	
Klebsiella pneumoniae	4	2.01	
Enterococcus faecium	4	2.01	2 HLAR
Enterobacter aerogenes	4	2.01	2 alert ESBL
Acinetobacter baumani	4	2.01	1 alert

Malecki R et al. Adv Clin Exp Med 2014,23:39-48.

Changing microbiological profile of pathogenic bacteria in diabetic foot infections: time for a rethink on which empirical therapy to choose?

Hindistan, tek merkez, 434 hasta

1991-2008 yılları,

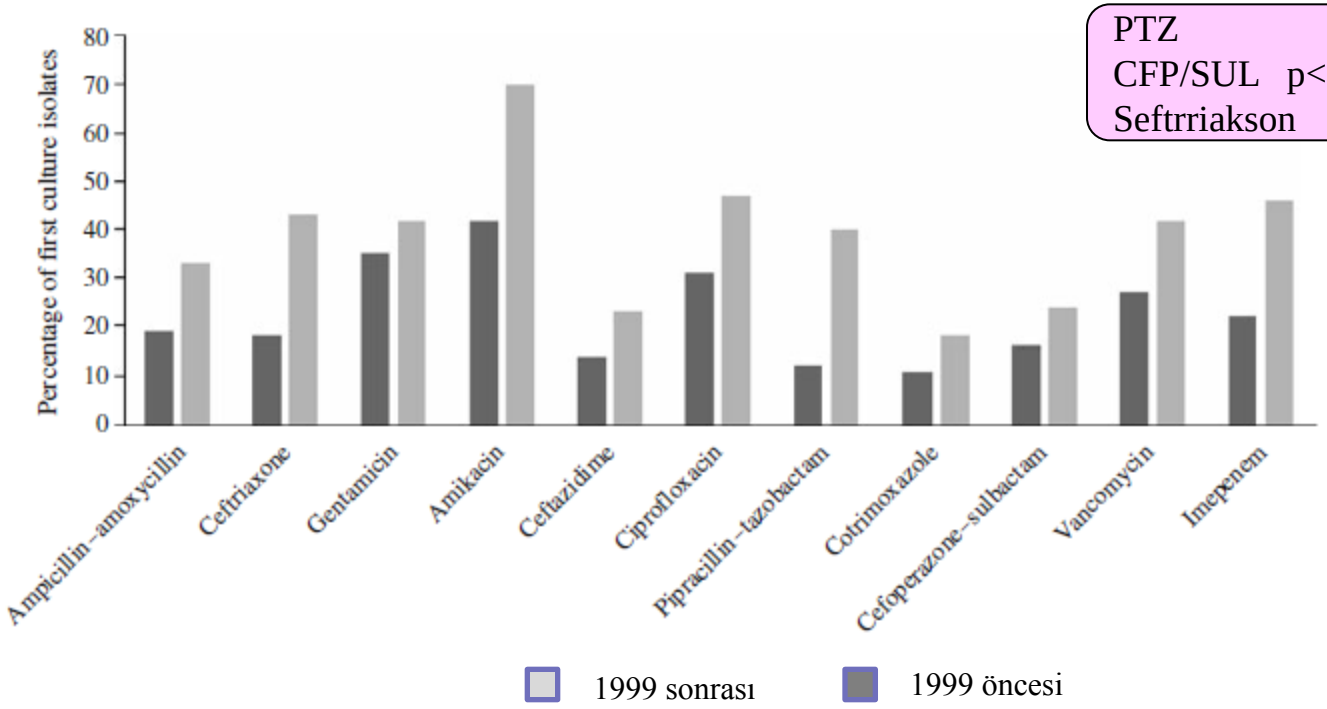
1999 öncesi ve sonrası karşılaştırılmış.

Polimikrobiyal %66 , monomikrobiyal %23, steril %11

En sık

- ***P.aeruginosa*** **%20.1,**
- *S .aureus* %17.2 (% 25 MRSA)
- *E.coli* %16.3 (MDR %81, GSBL oranı %56)

Ramakant P et al. Diabetologia 2011; 54:58–64



Ramakant et al. Gram negatif bakterilerde 1999 öncesi ve sonrası antibiyotik direnci

A Clinico-microbiological Study of Diabetic Foot Ulcers in an Indian Tertiary Care Hospital

- 183 izolat
- Gram (-) : %51.4
- Gram (+) : %33.3
- Anaerob bakteriler %15.3

Etkenler

***S.aureus* %13.3**

***Proteus spp* %12.6**

***E.coli* % 12**

Table 2—*Antimicrobial susceptibility pattern of aerobic bacterial isolates from infected foot ulcers in diabetic patients (n = 80)*

	Proportion susceptible (%)	
Antimicrobial agent (µg)	*S.aureus* (n = 25)	CoNS (n = 12)
Methicillin sensitive	11 (44.0)	6 (50.0)
Methicillin resistant	14 (56.0)	6 (50.0)
Amikacin (30)	8 (57.1)	4 (66.7)
Erythromycin (15)	2 (14.3)	2 (33.3)
Tetracycline (30)	5 (35.7)	4 (66.7)
Ciprofloxacin (5)	5 (35.7)	3 (50)
Clindamycin (2)	6 (42.8)	6 (100.0)
Chloramphenicol (30)	9 (64.3)	6 (100.0)
Rifampicin (5)	10 (71.4)	6 (100.0)
Cotrimixozole (1.25/23.75)	5 (35.7)	6 (100.0)

			Pseudomonas	*Acinetobacter*	*Klebsiella pneumoniae*
n					12
Amikacin (30					8 (66.6)
Amoxcillin-cl					8 (66.6)
Imipenem (10					12 (100.0)
Cefotaxime (3					8 (66.6)
Ceftazidime (					8 (66.6)
Ciprofloxacin					6 (50.0)
Meropenem (					12 (100.0)
Piperacillin (1					5 (41.6)
Pipercillin-tazobactam (100/10)	12 (52.2)	10 (45.4)	13 (72.2)	13 (76.5)	8 (66.6)
Cefperazone-sulbactam (75/10)	20 (86.9)	20 (86.3)	16 (88.8)	15 (88.2)	12 (100.0)
Ticarcillin-clavum (75/10)	20 (86.9)	16 (72.7)	16 (88.8)	14 (82.3)	10 (83.3)

	%
Sefotaksim ve amikasin	:34.7 -76.4
Siprofloksasin	50- 86.9
PTZ	45.4-76.5
İmipenem	100 duyarlı

Gadepalli R et al. Diabetes Care 2006;29:1727-32

Clinical Characteristics and Risk Factors of Diabetic Foot Ulcer With Multidrug-Resistant Organism Infection

1 yıl, retrospektif, Çin

157 hasta, 146 izolat

- Gram (-) bakteri 72 (% 49)
- Gram (+) bakteri 74 (%51)

En sık etkenler:

- *Enterobacter spp.* 36 (%24.6)
- *S.aureus* 18 (%12.3)
- *S epidermitis* 16 (%11)
- *P.aeruginosa* 16 (%11)

78 izolat (%53.4) MDR

- ***S.aureus* (%16.7)**
- ***Enterobacter spp.* (%16.7)**
- ***P.aeruginosa* ((%15.4)**

Ji X et al. Int J Lower Extremitiy Wounds 2014; 13:64-71.

Table 1. Isolated Bacteria and Resistance Distribution in Patients With Diabetic Foot Ulcer.

Bacteria	MDROs (+), n (%)	MDROs (−), n (%)	Total, n (%)
Gram-positive bacteria			
Staphylococcus aureus	13 (72.2)	5 (27.8)	18 (12.3)
Staphylococcus epidermidis	11 (68.8)	5 (31.2)	16 (11.0)
Staphylococcus haemolyticus	4 (100.0)	0 (0.0)	4 (2.7)
Other *Staphylococcus* spp[a]	5 (45.4)	6 (54.6)	11 (7.5)
Enterococcus spp	7 (53.8)	6 (46.2)	13 (8.9)
Streptococcus spp	1 (11.1)	8 (88.9)	9 (6.2)
Others	0 (0.0)	3 (100.0)	3 (2.1)
Gram-negative bacteria			
Pseudomonas aeruginosa	12 (75.0)	4 (25.0)	16 (11.0)
Escherichia coli	4 (57.1)	3 (42.9)	7 (4.8)
Enterobacter spp	13 (36.1)	23 (63.9)	36 (24.6)
Proteus mirabilis	6 (85.7)	1 (14.3)	7 (4.8)
Others	2 (33.3)	4 (66.7)	6 (4.1)
Total	78	68	146

Abbreviation: MDRO, multidrug-resistant organism.

[a]Other *Staphylococcus* spp: *Staphylococcus lentus, Staphylococcus lugdunensis, Staphylococcus saprophyticus, Staphylococcus intermedius, Staphylococcus kloosii.*

Ji X et al. Int J Lower Extremitiy Wounds 2014; 13:64-71.

Table 2. Resistance Rate of Gram-Negative MDROs to Commonly Used Antimicrobial Drugs.

	Pseudomonas aeruginosa (n =912)		*Escherichia coli* (n = 4)		*Enterobacter* spp (n = 13)		*Proteus mirabilis* (n = 6)	
Antimicrobial Drugs	Case	Resistance Rates (%)	Case	Resistance Rates (%)	Case	Resistance Rates (%)	Case	Resistance Rates (%)
Amikacin	3	25.0	0	0	0	0	0	0
Ampicillin	8	66.7	4	100.0	11	84.6	6	100.0
Ampicillin/sulbactam	8	66.7	3	75.0	6	46.2	3	50.0
Piperacillin	1	8.3	2	50.0	0	0	1	16.7
Aztreonam	1	8.3	2	50	2	15.4	0	0
Nitrofurantoin	9	75.0	1	25.0	9	69.2	6	100.0
Sulfamethoxazole	7	58.3	3					.7
Cefazolin	7	58.3	4					.3
Cefuroxime	4	33.3	4					.7
Cefotetan	5	41.7	2					
Ceftriaxone	6	50.0	0					.3
Ceftazidime	3	25.0	2					.7
Cefepime	4	33.3	4					.7
Levofloxacin	3	25.0	1					.7
Ciprofloxacin	4	33.3	3					.3
Tobramycin	2	16.7	1					.7
Imipenem	1	8.3	0					.7
Gentamicin	7	58.3	1	25.0	3	23.1	2	33.3

	%
3. kuşak sefalosporinler	23-50
Semisentetik penisilinlere	66.7-100
Amikasin	0-25
Florokinolon	15.4-25
İmipeneme *enterobacter spp*	15.4
P.aeruginosa	8.3

Ji X et al. Int J Lower Extremitiy Wounds 2014; 13:64-71.

Research Article

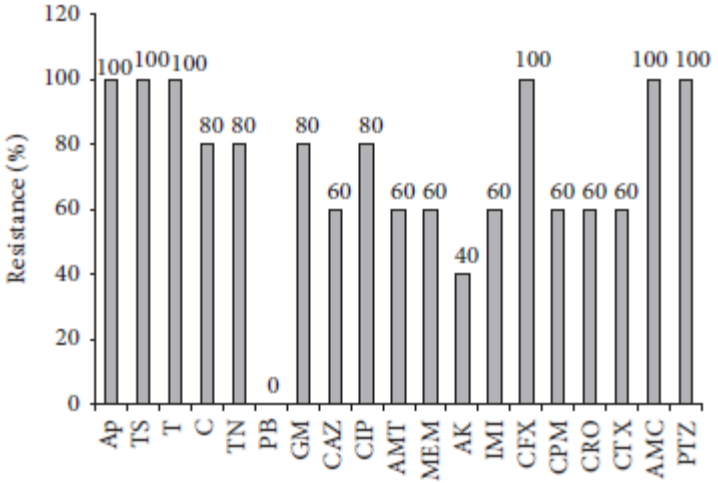
Isolation and Antibiotic Susceptibility of the Microorganisms Isolated from Diabetic Foot Infections in Nemazee Hospital, Southern Iran

- 2012-2014,122 izolat
- *Enterococcus spp*. 34(%27)
  KNS 28(%22)
  E.coli 25(%20)
- Gram (+) bakterilerde direnç

MRSA % 78

- Gram (-) bakterilerde direnç

GSBL %53



Anvarinejad M et al. Journal of Pathogens 2015

DAİ etkenler ve direnç

Çalışmacı Yayın yılı	Ülke	İzolat N	Gram (+) %	Gram (-) %	Anaerob %	İlk 2 etken (%)	Direnç (%) (MRSA, GSBL, IBL)
Ramakant et al. 2011	Hindistan					*P.aeruginosa (20.1)* *S.aureus (17.2)*	**MRSA (25)** **GSBL(56)** **MDR (81)**
Gadepalli et al. 2006	Hindistan	183	33.3	51.4		*S.aureus (13.7)* *Proteus spp (12.6)*	**MRSA (56)** **GSBL (44.7)**
Gee et al.	ABD	1817	68	24	6	*Staphylococcus* spp *Enterococcus* spp	**MRSA (12)**
Citron et al.2007	ABD	1607				*taphylococcus spp* 4) *reptococcus spp* 5.5)	
Malecki et al, 2014	Polonya	199				*E.faecalis*(16) *S. aureus(15.5*)	**MRSA (6.5)** **GSBL (22.2)**
Richard Jet al. 2008	Fransa	271	59	33.6	7.4	*S.aureus*(37) *E.aerogenes* (33.6)	**MRSA(62.7)** **MDR (21.8)**
Anvarinejad D, et al 2015	İran	122	63.9	30.3		*Staphylococcus spp* (29) *Enterococus spp*(27)	**MRSA (78)** **GSBL (53)**

MRSA % 6.5-78

GSBL % 22.2-56

- DAİ da en sık etkenler *S.aureus*, *P.aeruginosa*, *Enterobacter spp.E.coli*
- Antibiyotik direnci (MRSA, GSBL, MDR) tüm dünyada önemli bir sorun
- Dirençli etken infeksiyonlarında hastane yatış ve tedavi süresi daha uzun

Zenelaj B et al. Int J Extrem Wounds 2014;13(4):263-72

Dirençli infeksiyon risk faktörleri

- Hastane yatış öyküsü
- Antibiyotik kullanımı öyküsü
- Cerrahi girişim, amputasyon öyküsü
- Glisemik kontrolün iyi olmaması
- Osteomyelit varlığı
- Retinopati, nefropati varlığı
- Ülser tipi (nöropatik ülser)
- Ülser boyutu (>4cm^2)

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Gadepalli R et al. Diabetes Care 2006; 29:1727-32.
Kandemir Ö et al. J of Infection 2007;54: 439-45.
.Ji X et al. Int J Lower Extremitiy Wounds 2014; 13:64-71

Sonuç olarak

- DAİ ve bu hastalarda ki direnç tüm dünyada önemli bir sorun
- Empirik tedavi için olası etkenlerin ve direnç durumunun bilinmesi
- Hastaya, klinik tabloya, olası etkene göre uygun antibiyotik tedavisi
- Etken saptandığında gereğinde tedavi değişikliği

- Antibiyotik tedavisi yanısıra
- Kan şekeri ve metabolik değişikliklerin düzenlenmesi
- Ayak bakımı,
- Hasta eğitimi
- Debridman ve cerrahi girişim

EKİP ÇALIŞMASI

Teşekkürler