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Comparison of Urine Cultures of Home Care and Palliative Care Patients; Cross-sectional Study

Evde Bakım ve Palyatif Bakım Hastalarının İdrar Kültürlerinin Karşılaştırılması; Kesitsel Çalışma

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Abstract

Aim: Urinary tract infections (UTI) are an important cause of mortality, especially in geriatric patients. The effectiveness of urine culture and appropriate antibiotic use in geriatric patients followed in primary care is important. We aimed to compare the urine cultures and antibiotic susceptibilities of patients over 65 years of age with urinary system infections, who continue to be treated at home by the Home Care Services (HCS) and those in the Palliative Care Service (PCS).

Material and Method: Between January 1, 2019 and January 1, 2020, the culture-antibiogram results of the urine samples of patients aged 65 years and older with urinary infection complaints and followed and treated by PBS and HCS were compared retrospectively.

Results: Of the 60 patients included in the study, 30 had PCS, 30 HCS patients had a mean age of 78.0±12.7 years, and PCS patients had a mean age of 80.7±9.8 years. According to the culture-antibiogram results of the urine samples of the patients, *E. coli* was the most common microorganism in both groups (p=0.003). When we look at the antibiotic sensitivity of the patients in the HCS group, Amikacin (96.7%), Cefoxitin (83.3%), Fosfomycin (73.3%), Nitrofurantoin (70%) sensitive and Ampicillin (76.7%), Cefuroxime (36%), Ceftazidime (40%) was found resistant to Ciprofloxacin (33%). PCS group is sensitive to Amikacin (60%), Cefoxitin (23.3%), Fosfomycin (23.3%), Nitrofurantoin (16.6%) and Ampicillin (40%), Cefuroxime (26.7%), Ceftazidime (33.3% were found to be resistant to Ciprofloxacin (53.3%). In both groups, the highest resistance rates were found in Ampicillin, 76.7% in HCS patients and 40% in PCS patients, and the highest sensitivity rates were in Amikacin, 96.7% in HCS and 60% in PCS.

Conclusion: Antibiotic resistance status of bacteria should be considered. Care should be taken in the selection of antibiotics in accordance with rational antibiotic principles, and treatment management planning should be done in the right time with the right drug, the right dose, the right application method.

Keywords: Geriatrics, home care, pallative care

Öz

Amaç: Üriner sistem infeksiyonları (USİ) özellikle geriatrik hastalarda önemli bir mortalite nedenidir. Birinci basamakta takip edilen geriatrik hastalarda idrar kültürü kullanımının uygun antibiyotik kullanımı etkinliği önemlidir. Evde Bakım Hizmetleri (EBH) tarafından evde tedavisine devam edilen 65 yaş üstü üriner sistem enfeksiyonu hastaların ve Palyatif Bakım Servisi (PBS)'nde yatan hastaların idrar kültürlerini ve antibiyotik duyarlılıklarını karşılaştırmayı amaçladık.

Gereç ve Yöntem: 1 Ocak 2019 – 1 Ocak 2020 tarihleri arasında Üriner enfeksiyon şikayetleri olan 65 yaş ve üstü PBS ve EBH tarafından takip ve tedavi edilen hastaların idrar örneğinin kültür-antibiyogram sonuçları retrospektif olarak karşılaştırıldı.

Bulgular: Çalışmaya dahil edilen 60 hastanın 30'u PBS, 30'u EBH hastalarının yaş ortalaması 78,0±12,7 ve PBS hastalarının yaş ortalaması 80,7±9,8 idi. Hastaların idrar örneklerinin kültür-antibiyogram sonuçlarına göre her 2 grupta da en sık rastlanan mikroorganizmanın *E. coli* olduğu görüldü (p=0,003). Hastaların antibiyotik duyarlılığına baktığımızda EBH grubunda Amikasin(%96,7), Cefoxitin (%83,3), Fosfomisin (%73,3), Nitrofurantoin (%70)'e duyarlı ve Ampisilin (%76,7) Cefuroxime (%36,7) Ceftazidime (%40) Ciprofloxacin (%33)'e dirençli bulundu. PBS grubu Amikasin (%60), Cefoxitin (%23,3), Fosfomisin (%23,3), Nitrofurantoin (%16,6)'e duyarlı ve Ampisilin (%40), Cefuroxime (%26,7), Ceftazidime(%33,3), Ciprofloxacin (%53,3)'e dirençli olduğu bulunmuştur. Her iki grupta da en yüksek direnç oranları EBH hastalarında %76,7, PBS hastalarında %40 olmak üzere Ampisilin olarak ve en yüksek duyarlılık oranlarının ise EBH'de %96,7, PBS'de %60 olmak üzere Amikasin'de olduğu bulunmuştur.

Sonuç: Akılcı antibiyotik ilkeleri doğrultusunda antibiyotik seçiminde dikkatli olunmalı, doğru zamanda, doğru ilaç, doğru doz, doğru uygulama yöntemi ile tedavi yönetim planlaması yapılmalıdır.

Anahtar Kelimeler: Geriatri, evde bakım, palyatif bakım

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INTRODUCTION

Physiological and morphological changes cause elderly and frail patients to become more vulnerable to infections.[1] Urinary system infection (UTI) often causes different clinical pictures ranging from asymptomatic bacteriuria that does not require treatment to life-threatening urosepsis.[2] In elderly and frail patients, factors such as insufficient fluid consumption, inactivity, urinary incontinence, and infected area in the perianal region increase the risk of UTI development.[1] Frail elderly patients, who are associated with various disabilities such as a series of physiological and morphological changes, urinary incontinence, immobility and cognitive impairment, are at particularly high risk for the development of UTI.[3] It is important to diagnose and appropriately treat these infections in the elderly.[4]

For this purpose, antimicrobial resistance studies and literature information in this field can help in the selection of the appropriate antibiotic to be used in the treatment. Because of UTI, which is the most common cause of antibiotic use in the elderly and fragile population, long-term and insufficient dosage of antibiotics can lead to the formation of antibacterial resistance and most importantly the development of resistant organisms.[4-5] The success of the treatment may vary depending on the infectious agent and the appropriate antibiotic.[5] It is important to be aware of it in terms of both good diagnosis and prevention in order to avoid negative consequences.[4]

In the aging process, which concerns the whole of our society, home care services have become a service mostly used by individuals over the age of 65 with chronic diseases.[6] Palliative care (PC) With increasing age and treatments for cancer and other chronic diseases, the need for PC at the population level is significant.[7] For this reason, we aimed to compare the causes of urinary system infection, urine cultures results and antibiotic susceptibility, of those over 65 years of age who continue to be treated and followed up in their own home by HCS and inpatient treatment in PCS.

MATERIAL AND METHOD

The study was carried out with the permission of Giresun University Faculty of Medicine Ethics Committee (Date: 22/09/2020, Decision No: KAEK-05). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The culture-antibiogram results of the urine samples of 60 patients who had urinary system infection complaints in PCS and HCS and were followed up and treated with UTI findings between 1 January 2019 and 1 January 2020 at Prof. Dr. A. İlhan Özdemir Training and Research Hospital were evaluated retrospectively. The detection of infection at the level of infection (105 cfu/ml) in the microbiology laboratories of Prof. Dr. A. İlhan Özdemir Training and Research Hospital was considered significant for urinary tract infection. Samples were seeded on 5% blood agar and Eosin Methylene Blue agar media. The media were incubated for 24-48 hours at 37°C under aerobic conditions. The number of growing colonies was expressed as CFU/ml. In addition to classical bacteriological methods, identification and antimicrobial susceptibility of the growing isolates were studied with the automated Vitek version 2.0 system (Biomerieux, France). Data Statistical analyzes were performed with IBM SPSS V23 (Chicago, USA). The number of samples to be taken in each group according to 95% confidence (1-α), 80% test power (1-β) and d=0.5 effect size one-tailed independent samples t test analysis using the G*Power program It is set to 30. Cases were numbered according to their file numbers, and the participants to be included in the study were assigned using a free internet-based random number generator (https://www.random.org) so that the number of patients in the groups was the same. Qualitative data were compared with the Pearson Chi-square test, and statistical significance was accepted as $p<0.05$.

RESULTS

Of the 60 patients included in the study, 30 were PCS and 30 were HCS followed and treated. While the mean age of the HCS group was78.0±12.7 the mean age of the PCS group was A 80.7±9.8 total of 21 male and 39 female patients were included in the study. When the sub-diseases were examined, it was found that the most common disease in both home care and palliative groups was cerebrovascular events. According to the culture-antibiogram results of the urine samples of the patients, *E. coli* was the most common urinary tract infection agent in both groups (**Table 1**)

Table:1 Descriptive Statistics

Microorganisms	Home Care (%)	Palliative Care (%)
E. coli	13(43.3)	6(20)
Proteus mirabilis	6(20)	2(6.7)
Klebsiella pneumoniae	8(26.7)	4(13.3)
Pseudomonas aeruginosa	2(6.7)	4(13.3)
Acinetobacter baumannii	1(3.3)	0
Candida albicans	0	5(16.7)
Enterecoccus faecalis	0	3(10)
Non Albicans Candida	0	4(13.3)
Providencia stuartii	0	1(3.3)
Serratia spp	0	1(3.3)

When microorganisms were compared according to resistance classification, it was seen that the most common microorganism Multi Drug Resistant (MDR) group was *Klebsiella pneumoniae* and Extensively Drug Resistant (EDR) *E. coli* was the most common microorganism.The microorganism encountered in the non-resistant group is *Candida albicans*. ($p<0.001$) (**Table 2**).

When the antibiotic resistances of the patients were compared with the microorganisms, it was determined that ampicillin resistance differed significantly according to the microorganism and the highest resistance was in *E. coli* bacteria. ($p=0.043$). The most sensitive microorganism to cefepime was *Pseudomonas aeruginosa* ($p=0.014$), while the most resistant microorganism to Ceftazidime was *E. coli* ($p=0.034$). *E. coli* was found to be

the most sensitive microorganism to imipenem (p=0.013) and Gentamicin (p=0.007). The most susceptible microorganism was *E. coli*, while the most susceptible microorganism was *Klebsiella pneumoniae* (p=0.001). The most sensitive microorganism to nitrofurantoin was *E. coli*, while the most resistant microorganism was *Proteus mirabilis* (p<0.001). Cefuroxime, cefoxitin, cefixime, ceftazidime, ceftriaxone, ertapenem, meropenem, amikacin, resistance status did not differ significantly according to the microorganism (p>0. 05) (**Table 3**)

Table 2: Comparison of Microorganisms by Resistance Classification

Mikroorganisms	Resistance Classification			p
	MDR(%)	EDR(%)	Non-resistant(%)	
Escherichia coli	3(15)	15(55.6)	1(7.7)	<0.001*
Proteus mirabilis	4(20)	4(14.8)	0	
Klebsiella pneumoniae	7(35)	5(18.5)	0	
Pseudomonas aeruginosa	3(15)	0	3(23.1)	
Acinetobacter baumannii	0	1(3,7)	0	
Candida albicans	0	0	5(38.5)	
Enterecoccus faecalis	2(10)	1(3.7)	0	
Non-albicans *Candida albicans*	0	0	4(3.8)	
Providencia stuartii	0	1(3.7)	0	
Serratia spp	1(5)	0	0	

*Fisher's Exact Test, MDR group (Multi Drug Resistant),EDR(Extensively Drug Resistant)

Table 3: Antibiotic resistances

Antibiotics		*E. coli* (%)	*Proteus mirabilis* (%)	*Klebsiella pneumoniae* (%)	p
Ampisilin	Sensitive	3(16,7)	0	0	0,043*
	Resistant	15(83,3)	7(100)	11(100)	
Amok.Kla	Sensitive	9(75,0)	2(40,0)	5(100)	0,075
	Resistant	3(25,0)	3(60,0)	0	
Sefepim	Sensitive	0	1(50)	0	0,014*
	Resistant	2(100)	1(50)	2(100)	
Cefuroxime	Sensitive	7(38,9)	3(42,9)	8(72,7)	0,235
	Resistant	11(61,1)	4(57,1)	3(27,3)	
Cefoxitin	Sensitive	15(83,3)	7(100)	9(81,8)	0,721
	Resistant	3(16,7)	0	2(18,2)	
Sefixim	Sensitive	7(38,9)	3(42,9)	8(72,7)	0,235
	Resistant	11(61,1)	4(57,1)	3(27,3)	
Ceftazidime	Sensitive	7(36,8)	4(50,0)	8(66,7)	0,034*
	Resistant	12(63,2)	4(50,0)	4(33,3)	
Ceftriaxone	Sensitive	7(38,9)	3(42,9)	8(72,7)	0,235
	Resistant	11(61,1)	4(57,1)	3(27,3)	
Ertapenem	Sensitive	17(94,4)	7(100)	9(81,8)	0,467
	Resistant	1(5,6)	0	2(18,2)	
İmipenem	Sensitive	19(100)	4(57,1)	9(81,8)	0,013*
	Resistant	0	3(42,9)	2(18,2)	
Meropenem	Sensitive	18(94,7)	8(100)	9(75,0)	0,108
	Resistant	1(5,3)	0	3(25,0)	
Amikasin	Sensitive	19(100)	8(100)	12(100)	0,062
	Resistant	0	0	0	

*p<0,05 Differences at the level of significance are statistically significant

DISCUSSION

Today, the increase in the elderly population and the health problems that may develop due to aging are increasing.[8] In this study; Bacteria and resistance profiles isolated from urinary tract infections in patients aged 65 and over were evaluated retrospectively according to the data of patients treated at home and treated in the palliative service.

The most common agents of urinary tract infections in the literature are *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Citrobacter* spp. They have been reported as members of the *Enterobacteriaceae* family.[5] Similarly, in this study, the most isolated bacteria from the sample from the types, respectively; *Escherichia coli*, *Klebsiella* spp, from the *Enterobacteriaceae* family and *Proteus mirabilis*. These microorganisms *Pseudomonas aeruginosa*, *Enterobacter aerogenes*, *Acinetobacter baumannii* were found as isolates.

According to the results of the retrospective analysis performed in our study, the most common microorganism in HCS (43.3%) and PCS (20%) wards was *E. coli*. The results show that *E. coli* species are highly responsible for community-acquired UTI, similar to the literature. *Candida albicans* infections take the second place in PBS patients. The reason for this may be the weakness of the immune system and urinary catheterization of the hospitalized patients.The widespread use of antibiotics has led to increased resistance to them, which makes the treatment of infections more difficult in the future.[9] The most commonly prescribed drugs in the treatment of UTI in our country are amoxicillin, amoxicillin clavunate, cephalosporins and trimethoprim-sulfamethoxazole(TMP-SMX) the most common parenteral therapies are aminoglycosides and third generation cephalosporins. Amoxicillin, cefixime, nitrofurantoin, and TMP-SMX are used in prophylaxis.[10] Ampicillin resistance was found to be 68.9% and TMP-SMX resistance was 46.7% in Kömüroğlu et al. evaluation of all gram-negative microorganisms together, revealed the highest resistance against ampicillin (75.1%), cefazolin (59%), ampicillin-sulbactam (49.7%),TMP-SMX (45.2%), cefixim (33.1%) and ceftriaxone (31.4%). The lowest resistance was against meropenem (3.2%), ertapenem (3.4%), colistin (7.2%), amikacin (16.2%), ciprofloxacin (21.1%) and piperacillin tazobactam (23.2%).[10]

In a study, the antibiotics to which *E. coli* strains are most sensitive and their resistance rates are as follows; amikacin (0.4%), tigecycline (2%), imipenem (2%), and meropenem (2%). The resistance rates in the antibiotics with the highest resistance are respectively; sefixime (32%), seftriaxone (29%) and TMP-SMX (28%) were detected.[11] In a study conducted in Turkey, the highest rate of ampicillin resistance was found to be (61.4%).[12] In our study, ampicillin resistance was (76.7%) in HCS patients and (76.7%) in PCS patients.

In this study, a high sensitivity of (96.7%) in HCS and (60%) in PCS was found for amikacin. In a study conducted in Iran, it was reported that *E. coli* is fully susceptible to amikacin and tobramycin.[13]

Considering the cefuroxime sensitivity of the patients, it was observed that the patients in the HCS group were (50%) and (10%) in PCS. In Cefoxitin, sensitivity rates were higher than resistance in both groups. cefixime, ceftriaxone, ceftazidime *E. coli* strains isolated from HCS patients showed high sensitivity to cephalosporin group antibiotics, while the rate of resistance to cephalosporin group increased in PCS patients. Inappropriate treatments pave the way for resistance development and an increase in economic burden.[10]

In this study It was found that while it was (33%) in ciprofloxacine patients in the home health group, it was (53.3%) in patients receiving palliative care. We see an increase in the development of resistance, especially in hospitalized patients. We think that one of the aims of antibiotic management is to act selectively to reduce antibiotic resistance and to use it more carefully in order to reduce increased health costs and higher complication risks.

It was determined that there were no ertapenem-resistant patients in the HCS group, and (10%) of the patients in the PCS group were resistant. Elderly patients have a higher risk of developing uroseptic shock than younger patients. [14] Again, the percentage of patients resistant to imipenem was (13.3%), respectively, while it was (6.7%) in the other group. Sensitivity rate to gentamicin is (86.7%) in HCS and (50%) in PCS.

In a study, the lowest resistance rates in *E. coli* strains isolated were nitrofurantoin (12.7%) and fosfomycin. (2.7%) was reported to develop against it.[15] In This study the sensitivity to fosfomycin was (73.3%) in ESR, it was (23.3%) in PBS, while the sensitivity to nitrofurantoin was (70%)in HCS and (16.7%) in PCS. It can be thought that these two antibiotics may affect the treatment positively in urinary tract infections. In a study conducted in Italy, it was reported that there was a significant decrease in fosfomycin resistance from (52.94%) to (33.6%).[16]

When the differentiation of the antibiotic susceptibilities of the patients was examined, it was observed that there was a significant differentiation according to the groups in all antibiotics except aztreonam, colistin, netilmicin. tobramycin, vancomisin and linezolida. Greater attention should be paid to the diagnosis and treatment of UTIs that affect elderly patients, who constitute a particularly vulnerable patient population.[17]

Limitations

In our study are that it is a retrospective study, the number of patients included in the study is small, and risk factors such as underlying immunosuppression were not compared in these patient groups. However, the frequent occurrence of urinary infections in the geriatric population will increase the success of prevention and treatment, knowing the resistance profiles of the reproducing microorganisms.

CONCLUSION

Antibiotic resistance status of bacteria should be considered. Care should be taken in the selection of antibiotics in accordance with rational antibiotic principles, and treatment management planning should be done in the right time with the right drug, the right dose, the right application method.

ETHICAL DECLARATIONS

Ethics Committee Approval: Permission for this study was obtained from Giresun University Clinical Researches Ethics Committee (Date: 22.09.2020, Decision No: KAEK -05)

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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REFERENCES

1. Dindar Demiray EK, Alkan S, Önder T ve ark. Yaşlılıkta Kırılganlık ve Üriner Sistem Enfeksiyonları. BSJ Health Sci.2022;5(1): 143-9
2. Alkan Çeviker S, Günal Ö, Kılıç SS. Investigation of risk factors in recurrent urinary tract infections in adults. Klimik Derg. 2019; 32(3): 303-9.
3. Kim SJ, Ryu JH, Kim YB et al. Management of Candiduria in Elderly Patients. Urogenit Tract Infect 2019;14(2):33-41
4. Latour K, Lepeleire J, Jans B et al. Diagnosis, prevention and control of urinary tract infections: a survey of routine practices in Belgian nursing homes. J Infect Prev. 2020 ;21(5):182-8.
5. Değirmenci H, Vural S, Yalçın S. İstanbul'da Bir Özel Hastanede üreme Yoluu Bulunan Hastalardan İzole Edilen Bakteriler ve Antibiyotik Duyarlılık Profillerinin Belirlenmesi. İGUABDER. 2022;(17):426-439.
6. Arslan HN, Rençber E. Evde Sağlık Hizmeti Alanlara Bakım Verenlerin Yükü ve Stresle Başa Çıkma Durumlarının Değerlendirilmesi. MMJ. 2022; 9(1): 33-9.
7. Havyer RD, Abedini N, Jayes RL et al.Palliative care: An update for internists. Cleve Clin J Med. 2022;89(5):262-8.
8. Ayhan M, Kaya Kalem A, Hasanoğlu İ ve ark. Geriatrik hastalarda idrar yolu enfeksiyonları ve etkenlerinin değerlendirilmesi.Turk Hij Den Biyol Derg, 2022;79(1):115-22.
9. Asadi Karam MR, Habibi M, Bouzari S. Urinary tract infection: Pathogenicity, antibiotic resistance and development of effective vaccines against Uropathogenic *Escherichia coli.* Mol Immunol. 2019;108:56-67.
10. Kömürlüoğlu A, Aykaç K, Özsürekçi Y ve ark. Gram Negatif İdrar Yolu Enfeksiyonu Etkenlerinin Antibiyotik Direnç Dağılımı: Tek Merkez Deneyimi. Türkiye Çocuk Hast Derg. 2018;12(1):10-7.
11. Alanlı R, Beşirbellioğlu BA, Çelik G. Toplum kaynaklı üriner enfeksiyon etkeni *Escherichia coli* suşlarında antibiyotik direnci. Hitit Med J 2021;3(2):1-5.
12. Avcıküçük H, Altın N. Evaluation of the Distribution and Antibiotic Resistance Profile of Strains Isolated from Urine Specimens İdrar Kültürlerinden İzole Edilen Bakteriler ve Çeşitli Antibiyotiklere Karşı Direnç Durumları. Klimik Derg. 2022;35(2):95-102.

13. Shams S, Hashemi A, Esmkhani M et al. Imipenem resistance in clinical *Escherichia coli* from Qom, Iran. BMC Res Notes 2018;11(1):314.
14. Hsiao CY, Chen TH, Lee YC et al. Risk factors for uroseptic shock in hospitalized patients aged over 80 years with urinary tract infection. Ann Transl Med. 2020;8(7):477.
15. Mağden K. İdrar kültürlerinden üretilen mikroorganizmalar ve antibiyotik duyarlılıkları. Kocaeli Med J 2021;10(2):16-21.
16. Serretiello E, Folliero V, Santella B et al. Trend of Bacterial Uropathogens and Their Susceptibility Pattern: Study of Single Academic High-Volume Center in Italy (2015-2019). Int J Microbiol. 2021;2021:5541706.
17. Gajdács M, Ábrók M, Lázár A et al. Urinary Tract Infections in Elderly Patients: A 10-Year Study on Their Epidemiology and Antibiotic Resistance Based on the WHO Access, Watch, Reserve (AWaRe) Classification. Antibiotics (Basel). 2021;10(9):1098.