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EVALUATION OF MICROBIAL AGENTS IN PATIENTS WITH CHRONIC SUPPURATIVE OTITIS MEDIA

KRONİK SÜPÜRATİF OTİTİS MEDİALI HASTALARDA MİKROBİYAL AJANLARIN DEĞERLENDİRİLMESİ

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ABSTRACT

Objective: Chronic suppurative otitis media (CSOM) is a disease caused by microorganisms, which occurs as a result of the chronicity of acute otitis media cases. Our study aims to identify causative microorganisms with ear cultures taken from patients with COM and to compare their sensitivity to various antibiotics.

Method: Included 108 patients who were diagnosed with CSOM. Ear discharge was sampled with sterile plastic swabs. The samples taken were inoculated on blood agar, eosin methylene blue agar, sabouraud dextrose agar, chocolate agar, Mueller-Hinton agar and triple sugar iron agar mediums. Antibiotic susceptibility profiles of the isolated pathogens were evaluated using the Vitek 2 and disk diffusion method.

Results: In our study *Staphylococcus aureus* grew in 28 (25.9%), *Pseudomonas aeruginosa* in 25 (23.1%), *Proteus mirabilis* in 8 (7.4%), and *Klebsiella spp* in 12 (11.1%) of the studied samples. In addition, it was determined that 14 (13%) patients had fungal agents as the source of infection. In antimicrobial susceptibility tests, for *S. aureus* vancomycin and tigecycline were found to be 100% and 96% sensitive, respectively; for *P. mirabilis* meropenem and amikacin were 100% sensitive; and for *Klebsiella pneumoniae*, 100% sensitivity of imipenem and amikacin was detected.

Conclusion: Inadequate and wrong treatments are those that are not based on culture and antibioGram results. Therefore, detecting the causative pathogen in the microbiology laboratory, producing an antibioGram, and presenting the most appropriate treatment options to clinicians will prevent the loss of time it will cause the patient in terms of treatment of this disease and pave the way for more rational treatments. To prevent the emergence of antibiotic-resistant bacteria in CSOM patients, it is recommended to evaluate the microbiological profile and antibiotic susceptibility profile of these patients.

Keywords: Antibiotic Susceptibility, Chronic Suppurative Otitis Media, Microbial Agents.

ÖZET

Amaç: Kronik süpüratif otitis media (KSOM), akut otitis media vakalarının kronikleşmesi sonucu ortaya çıkan mikroorganizmaların neden olduğu bir hastalıktır. Çalışmamız, KOSM'lu hastalardan alınan kulak kültürleri ile etken mikroorganizmaları belirlemeyi ve çeşitli antibiyotiklere duyarlılıklarını karşılaştırmayı amaçlamaktadır.

Yöntem: KSOM tanısı almış 155 hasta dahil edildi. Kulak akıntısı steril plastik sürüntülerle örneklendi. Alınan örnekler kanlı agar, eozin metilen mavisi agar, sabouraud dekstroz agar, çikolatalı agar, Mueller-Hinton agar ve üçlü şekerli demir agar besiyerlerine inoküle edildi. İzole edilen patojenlerin antibiyotik duyarlılık profilleri Vitek 2 ve disk difüzyon yöntemi kullanılarak değerlendirildi.

Bulgular: Çalışmamızda incelenen örneklerin 28'inde (%25,9) *Staphylococcus aureus*, 25'inde (%23,1) *Pseudomonas aeruginosa*, 8'inde (%7,4) *Proteus mirabilis* ve 12'sinde (%11,1) *Klebsiella spp* üredi. Ayrıca 14 (%13) hastada enfeksiyon kaynağı olarak mantar etkeni olduğu belirlendi. Antimikrobiyal duyarlılık testlerinde S. aureus vankomisin ve tigesiklin için sırasıyla %100 ve %96 duyarlı bulunmuş; *P. mirabilis* için ise meropenem ve amikasin duyarlılığı %100 bulunmuştur; *Klebsiella pneumoniae* için ise imipenem ve amikasinin %100 duyarlılığı saptandı.

Sonuç: Yetersiz ve yanlış tedaviler kültür ve antibiyoGram sonuçlarına dayanmayan tedavilerdir. Bu nedenle mikrobiyoloji laboratuvarında etken patojenin saptanması, antibiyoGram üretilmesi ve klinisyenlere en uygun tedavi seçeneklerinin sunulması bu hastalığın tedavisi açısından hastaya yol açacağı zaman kaybını önleyecek ve daha akılcı tedavilerin önünü açacaktır. KSOM hastalarında antibiyotiğe dirençli bakterilerin ortaya çıkmasını önlemek için bu hastaların mikrobiyolojik profilinin ve antibiyotik duyarlılık profilinin değerlendirilmesi önerilir.

Anahtar Kelimeler: Antibiyotik Duyarlılığı, Kronik Süpüratif Otitis Media, Mikrobiyal Ajanlar.

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INTRODUCTION

Otitis media (OM) is a general name given to the inflammatory disease of the mucoperiosteum of the middle ear cavity, regardless of its cause and pathogenesis (Mea et al., 2020). Middle ear inflammation risk factors include immunodeficiency, genetic predisposition, anatomical differences, smoking exposure, low socioeconomic level, palate anomalies, down syndrome, physiological dysfunctions (Eustachian tube angle in children), allergy, and newborn feeding methods. The definition of OM includes more than one disease that various studies classify differently. These are known as meningitis, acute otitis media (AOM), secretory otitis media (SOM), and chronic suppurative otitis media (CSOM) (Casselbrant et al., 2016; Koçyiğit et al., 2016). The World Health Organization (WHO) estimated that the prevalence of CSOM was the highest (> 4%) in Tanzania, Guam, Australian Aborigines, Solomon Islands, India, and Greenland and requires immediate attention to deal with the health problem (Mea et al., 2020). Common aerobic bacteria that cause CSOM are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli* More Details, *Klebsiella pneumoniae*, *Proteus mirabilis*, etc. Anaerobic bacteria include *Bacteroides spp*, *Peptostreptococcus spp*, *Fusobacterium spp*, *Propionibacterium spp*, *Prevotelphyum spp*. fungi like *Aspergillus spp* (*A. niger*) and Candida spp are also known to cause CSOM. The etiological factors of CSOM can vary from one geographic region to another (Abraham et al., 2019; Sattar et al., 2012; Shetty & Shetty, 2014).

These microorganisms can enter the middle ear cavity in two ways; through the eustachian tube and external auditory canal (EAC). Anomalies in the protective function of the eustachian tube and undeveloped mastoid cells are the most important factors. In cases where mastoid development is insufficient, the drainage and ventilation paths between the middle ear, mastoid, and eustachian tube are easily blocked and cause the infection to become chronic. Ciliary insufficiency in the middle ear and eustachian tube also facilitates chronicity. Surgical treatment is indicated in patients with active COM. In these cases antibiotic prophylaxis is given to the patient before the surgery. In this context, antibiotics effective against beta-lactamase-resistant anaerobes should be preferred (Akinjogunla & Enabulele, 2011; Granath, 2017). Antibiotic drops are given for external ear infections. Boric acid drops of 2% can be used to clean the epithelial debris and dirt in the EAC. If no result can be obtained with this treatment, a culture should be taken from the EAC and an antibiotic selection should be made (Bareeqa & Ahmed, 2018; Çeviker et al., 2019). However, fungal infection is one of the common conditions encountered in a general otolaryngology clinic, and its prevalence has been reported to rise up to 9% in patients presenting with signs and symptoms of external ear inflammation. Aspergillus and Candida species are the most frequently detected fungal pathogens in otomycosis. Studies show that most of the pathogenic fungi in otomycosis belong to *Aspergillus spp*. Patients with severe chemotherapy regimens and bone marrow or solid organ transplant recipients constitute the group of patients at high risk for these infections. High rates of A. niger in ear samples have attracted attention in the studies (Anthwal & Thompson, 2016; Yang et al., 2021). As a result, infections such as CSOM will continue unless it is possible to target high-risk groups, especially in developing countries. Continuous evaluation of antibiotic sensitivity of pathogenic agents is important to reduce the risk of potential complications by early application of appropriate treatment. In this study, we aim to find the microorganisms that cause CSOM in patients admitted to the otorhinolaryngology (ORL) outpatient clinic of Faculty of Medicine Training and Research Hospital and to determine the most appropriate antibiotics to use.

MATERIAL AND METHODS

Sample Collection

The sample of our study was taken from a total of 155 patients (89 males, 66 females) diagnosed with CSOM who applied to the ORL outpatient clinic of our hospital between November 2017 and June 2018. The outer ear canal of the patients was cleaned with alcohol (70%). Ear discharge was taken with sterile plastic swabs (1.5 mm diameter cotton wrapped around the tip) and transported to the medical microbiology laboratory for bacteriological and mycological examinations in a Stuart transport medium.

Culture Media Used

Blood agar (HiMedia, Germany), Eosin Methylene Blue agar (EMB) (Oxoid, United Kingdom), Sabouraud Dextrose agar (SDA) (Oxoid, UK), Chocolate agar (HiMedia, Germany), Mueller-Hinton agar (MHA) (HiMedia, Germany), and Triple Sugar Iron agar (TSI) (Oxoid, UK) media were used.

Quality Control for Culture and Susceptibility Test

American Type Culture Collection (ATCC) strains (*S. aureus* ATCC 25923, *K. pneumoniae* ATCC 13883, *P. aeruginosa* ATCC 27853, and *P. mirabilis* ATCC 35659) were used as control groups in the study.

Identification of Microbial Agents

All samples inoculated into the above culture media were examined macroscopically and microscopically after 18-24 hours of incubation at 35-37°C. In a macroscopic examination of bacteria with Gram staining, colonies growing only in the blood agar medium were Gram-positive, colonies growing in both the blood agar and the EMB medium were evaluated as Gram-negative, and growth in SDA was evaluated as fungi. For Gram-positive bacteria catalase and coagulase tests, and Gram-negative bacteria citrate; inoculation in the TSI medium and an indole test was performed and evaluated (Mahaluça et al., 2019; Kar & Nath, 2017). Strains that could not be identified by conventional methods were identified using the Vitek 2 (BioMerieux, France) automated identification system.

Antibiotic Susceptibility Test

The Vitek 2 fully automated identification system was used to identify the species-level and antibiotic susceptibility of bacterial isolated as a result of macroscopic and microscopic examinations of cultures with Gram staining. Gram-positive, Gram-negative, and *Streptococcus* panels were used. 0.5 McFarland prepared from bacterial colonies was on panels specific to the groups and taken to the Vitek 2 device.

This device was evaluated by reading the identification and antibio gram of the microorganisms in the panels within a maximum period of 18 hours. In cases where the device could not evaluate identification and or the antibio gram, colonies of the microorganism were taken and an antibioGram was performed by the manual disc diffusion method. Here, 0.5 McFarland was prepared and inoculated on an MHA medium, and discs suitable for the type of bacteria were placed on the medium.

After the microorganism's incubation for 18-24 hours at 37°C, the zone diameters and MIC values formed around the discs were evaluated as being susceptible, moderately sensitive or resistant according to EUCAST criteria (Kahlmeter G; 2019).

Statistical Analysis

The data obtained from the study were analyzed with the SPSS 21.0 Package ProGram. Mean, standard deviation (±), and percentage distributions are given as descriptive statistics. Chi-Square analysis was used for the comparisons of parameters and the results were evaluated at a 95% ($p < 0.05$) significance level.

RESULTS

Culture samples were taken from 108 patients presenting to the hospital between November 2017 and June 2018 where 89 (57.4%) of them were men and 66 (42.6%) were women. When the distribution by gender was examined, it was seen that the median of otitis infections was higher in males and this difference was statistically significant ($p=0.048$). Diphtheroid and CNS, formerly thought to be non-pathogenic, grew in 47 patients. Microorganisms accepted as pathogens grew in 108 of the patients. The most frequently isolated bacteria among all microorganisms were 28 *S. aureus* (25.9%), 25 *P. aeruginosa* (23.1%), 12, *Klebsiella spp*. (11.1%), and 8 *P. mirabilis* (7.4%). In addition, the species distribution of the fungal isolates was analyzed. Of these, 6 (5.6%) *A. flavus*, 4 (3.7%) *A. niger*, 1 (0.9%) *Stephanoascus ciferrii*, and 3 (2.8%) were *C. albicans*. It was observed that 44 of these patients were female (40.7%) and 64 were male (59.3%) [Table 1]. The distribution of microorganism species breeding in men and women is shown in [Table 2]. It was found to be statistically significant that bacterial infections were moderately higher in males.

Table 1. Distribution of microbial isolates by gender

Bacterial isolates	**Female**	**Male**	**Total (%)**
S. aureus	14	14	28 (25.9)
P. aerugionas	8	17	25 (23.1)
K. pneumoniae	5	3	8 (7.4)
K. oxytoca	0	4	4 (3.7)
P. mirabilis	1	7	8 (7.4)
Streptococus spp	2	3	5 (4.7)
E. coli	1	2	3(2.8)
Achromobacter	1	1	2 (1.9)
Serratia marcescens	0	1	1(0.9)
Citrobacter koseri	0	1	1 (0.9)
Leuconostoc	0	1	1 (0.9)
Aermonas salmonicida	1	0	1 (0.9)
Acinetobacter baumannii	0	1	1 (0,9)
Sphingomonas paucimobilis	0	1	1 (0.9)
H. influenzae	0	1	1(0.9)
Streptococcus parasanguinis	1	0	1 (0.9)
Enterococcus spp.	0	1	1 (0.9)
Streptococcus pneumoniae	1	0	1 (0.9)
Neisseria meningitidis	0	1	1 (0.9)
Fungal isolates			
Aspergillus flavus	3	3	6 (5.6)
Aspergillus niger	3	1	4 (3.7)
Candida albicans	3	0	3 (2.8)
Stephanoascus ciferrii	0	1	1 (0.9)
Total	**44**	**64**	**108**

Table 2: Antimicrobial susceptibility pattern (%) of bacterial isolates from ear discharge samples.

Antibiotic agents	*S. aureus* (n=28)			*P. aeruginosa* (n=25)			*P. mirabilis* (n=8)			*K. pneumoniae* (n=8)		
	S	**R**	**I**	**S**	**R**	**I**	**S**	**R**	**I**	**S**	**R**	**I**
Penicillin	8.4	91.6	0	-	-	-	-	-	-	-	-	-
Oxacillin	28.6	71.4	0	-	-	-	-	-	-	-	-	-
Gentamicin	82.1	14.3	3.6	48	52	0	75	25	0	50	50	0
Ciprofloxacin	78.57	21.43	0	36	64	0	75	25	0	50	50	0
Erythromycin	35.7	53.6	10.7	-	-	-	-	-	-	-	-	-
Clindamycin	50	50	0	-	-	-	-	-	-	-	-	-
Linezolid	92.9	7.1	0	-	-	-	-	-	-	-	-	-
Teicoplanin	85.7	14.3	0	-	-	-	-	-	-	-	-	-
Vancomycin	100	0	0	-	-	-	-	-	-	-	-	-
Tetracycline	57.1	42.9	0	0	100	0	-	-	-	-	-	-
Tigecycline	96.4	3.6	0	4	96	0	-	-	-	-	-	-
Fusidic acid	57.1	25	17.9	-	-	-	-	-	-	-	-	-
Trimethoprim/sulfamethoxazole	85.7	14.3	0	0	100	0	25	75	0	37.5	62.5	0
Amikacin	-	-	-	56	44	0	100	0	0	75	25	0
Ceftazidime	-	-	-	65	4	32	87.5	12.5	0	25	75	0
Cefepime	-	-	-	64	32	16	-	-	-	-	-	-
Piperacillin	-	-	-	44	36	20	-	-	-	-	-	-
Netilmicin	-	-	-	52	48	0	-	-	-	-	-	-
Meropenem	-	-	-	64	36	0	100	0	0	100	0	0
Levofloxacin	-	-	-	40	60	0						
Imipenem	-	-	-	64	36	0	50	50	0	100	0	0
Aztreonam	-	-	-	32	64	0	-	-	-	-	-	-
Tobramycin	-	-	-	56	44	0	-	-	-	-	-	-
Ertapenem	-	-	-	-	-	-	87.5	12.5	0	-	-	-

Amoxicillin/ clavulanic acid	-	-	-	-	-	-	100	0	0	25	75	0
Cefuroxime	-	-	-	-	-	-	87.5	12.5	0	25	75	0
Cefuroxime axetil	-	-	-	-	-	-	87.5	12.5	0	25	75	0

* The Vitek 2 device was studied with AST P 640 (for *S. aureus*), N326 (for *P. aeruginosa*), and N327 (for *P. mirabilis* and *K. pneumoniae*) cards according to the EUCAST MIC values.
** S: Susceptibile, R: Resistance, I: Intermediate

In addition, fungal agents (*Aspergillus spp*, *Candida spp*, and *Stephanoascus spp*) thought to be causative pathogens were isolated from 14 of the patients. There was no statistically significant difference between sex and fungal species ($p>0.05$). Isolates and their antibiotic susceptibilities are given in Table 2 below. *Pseudomonas* strains were found to be the least sensitive (0.0%) antibiotic to trimethoprim/sulfamethoxazole and tetracycline. 64% sensitivity was found for cefepime and imipenem. *Pseudomonas* spp strains were found to be susceptible to amikacin and tobramycin (56%) [Table 2].

The most frequently isolated pathogen *S. aureus* susceptibility was found to be between 8.4% and 100% against various antibiotics. *S. aureus* strains were found to be susceptible to vancomycin (100%), and the least sensitive to penicillin (8.4%). It was also observed that 71.4% resistance to oxacillin developed and it was 96.4% sensitive to tigecycline [Table 2]. *Proteus spp* was found to be sensitive to meropenem, amikacin, and amoxicillin (100%) [Table 2].

K. pneumoniae was found to be sensitive to various antibiotics at rates varying between 25% and 100%. *K. pneumoniae* was found to be 25% sensitive to cefuroxime, cefuroxime axetil, ceftazidime, and amoxicillin/clavulanic acid, and with 100% sensitivity to imipenem, and meropenem [Table 2].

Enterococcus species were susceptible to rifampicin, trimethoprim/ sulfamethoxazole, ceftazidime, ciprofloxacin, amoxicillin/ clavulanic acid, vancomycin, cefazolin, but resistant to clindamycin and erythromycin. *Sphingomonas paucimobilis* was resistant to cefoperazone, cefazolin, imipenem, amoxicillin/clavulanic acid, vancomycin, cefepime, trimethoprim/ sulfamethoxazole, amikacin, ceftazidime, gentamicin, ampicillin, and tobramycin. Acinetobacter baumannii isolate was found to be sensitive to amikacin, colistin, and tigecycline, less sensitive to trimethoprim/sulfamethoxazole and netilmicin, and resistant to other antibiotics used. Antifungal susceptibility test for fungal isolates and antibiotic susceptibility test for anaerobic bacteria were not performed in this study.

DISCUSSION

Middle ear infections common in children are usually seen in 10%-15% of children. Given the recurrent nature of middle ear infections which can be painless and the fact that children are most affected but the least able to express themselves, the presence of this disease tends to be underdiagnosed. Delay in diagnosis may result in a higher rate of post-infectious complications. Therefore, avoiding risk factors is recommended as a means of preventing the first episode. If not treated, complications such as facial paralysis, hearing loss, brain abscess, autistic hydrocephalus, lateral sinus thrombosis, meningitis, and labyrinthitis are possible (Basaran et al., 2019; Çeviker et al., 2019; Tham et al., 2018).

Disruption of body defense mechanisms, internal and external stress factors, portents in the body facilitate the disease formation of *S. aureus* (Tong et al., 2015). The most common causative organisms isolated in another study were *S. aureus* (48.69%) and *P. aeruginosa* (19.89%) among 191 aerobic isolates. Anaerobes constituted 29.41% of isolates, and 12.25% were fungi (Bansal et al., 2019) Saunders et al. reported that a wide variety of microorganisms were produced in their study, and the order of frequency was *S. aureus*, *Corynebacterium spp*, and *P. aeruginosa* (Saunders et al., 2011). In another study, 22 (25.4%) *S. aureus* strains were isolated from 117 patients clinically diagnosed with CSOM (Mozafari Nia et al., 2011).

Prakash et al. (2013) reported that they isolated 93 (48.69%) *S. aureus* from ear discharge samples taken from 204 patients diagnosed with CSOM. Changes in isolation rates in the studies may be due to regional, seasonal, and laboratory methods. It has been reported that differences in pathogenic factors are observed in CSOM patients depending on the duration of the disease (Prakash et al., 2013). It was found that 25.9% (28 of 108 cases) we encountered in our study had S. aureus at a rate similar to other studies.

Although the main treatment method of CSOM is surgery, conservative treatment is also very important. The primary aim of CSOM surgery is to provide an ear that stays dry, recurrent infection is prevented, the perforation is closed and to improve hearing. Detection of causative microorganisms in CSOM reveals the importance of antibiotic use in conservative treatment (Çeviker et al., 2019; Öktemer

et al., 2016). In addition, to clear the debris in the middle ear cavity local and systemic antibiotic therapy applied according to the results of culture and sensitivity tests is essential for successful treatment (Çeviker et al., 2019). In one study, the antimicrobial profile of aerobic isolates showed maximum sensitivity to amikacin (95.5%), ceftriaxone (83.4%), and gentamicin (82.7%) (Öktemer et al., 2016).

In our study, the causative microorganisms causing CSOM were isolated by culture, and their antibiotic susceptibilities were compared with each other. The use of antibacterial drugs in CSOM treatment must be at a dose that will provide sufficient tissue concentration, maintained for the appropriate period and in the appropriate spectrum of action. This is because its treatment causes serious problems and may lead to new infection attacks (Çeviker et al., 2019; Chong et al., 2021). In some studies, it has been determined that *Pseudomonas spp* and methicillin-resistant *Staphylococcus aureus* (MRSA) can resist fluoroquinolone antibiotics. Therefore, treatment should be planned according to the culture and antibio gram results (Couzos et al., 2003).

In a study conducted, the lowest resistance level was found to be imipenem 4%, meropenem 7%, and amikacin 8% in *P. aeruginosa* strains, while the highest resistance was found to be against piperacillin 70% (Malçok HK., 2006). In our study, the lowest resistance level in *P. aeruginosa* strains was found to be ceftazidime 4%, while the highest resistance was found against trimethoprim/sulfamethoxazole. In recent years, insufficient and incorrect use of antibiotics has caused an increase in resistant strains and thus treatment failures (Ippolito et al., 2010). In our study, imipenem (36%), meropenem (36%), and amikacin (44%) were found to be resistant in *P. aeruginosa* strains. In a study conducted in Turkey, two antibiotics to which the *Pseudomonas* genus was most sensitive were ceftazidime (97.6%) and ciprofloxacin (93.5%), whereas the least sensitive (1.2%) was found against trimethoprim. The genus *Staphylococcus* showed the following sensitivity to the antibiotics tested: gentamicin (92.7%) and cefotaxime (92.7%), *Klebsiella spp* showed sensitivity to ceftriaxone (98.3%) and gentamicin (96.6%) antibiotics, *Streptococcus spp* was sensitive to cefuroxime (97.8%), cefotaxime (95.6%), ceftriaxone (95.6%), and gentamicin (95.6%).

In addition, *Proteus spp* showed sensitivity to ceftazidime, ceftriaxone, ciprofloxacin, gentamicin, and ofloxacin antibiotics at 100% (Kef K., 2019). Catakoğlu et al. (2016) reported that all *P. aeruginosa* strains (58 isolates) isolated from 162 patients due to the diagnosis of CSOM were susceptible to amikacin (3.4%) and gentamicin (3.4%). On the other hand, the resistance rates were observed high for cefuroxime (82.7%) and trimethoprim/sulfamethoxazole (89.6%). In the same study, the susceptibility of S. aureus strains isolated was 5.8% to trimethoprim/sulfamethoxazole, and 8.8% to cefuroxime and oxacillin. It was determined that 88.2% of the strains were resistant to penicillin (Hikmet Catakoglu et al., 2016).

In our study, ceftazidime, meropenem, and imipenem (64% each) were the most effective antibiotics for *P. aeruginosa* isolates, but resistance rates were found against trimethoprim/sulfamethoxazole, tetracycline (100% each), and tigecycline (96%). Our study results showed that vancomycin, tigecycline, and linezolid are the most effective antibiotics in the treatment of CSOM agent *S. aureus*, and imipenem and meropenem are the most effective antibiotics against Gram-negative bacteria (*K. pneumoniae* and *P. mirabilis*). Meropenem, imipenem, and ceftazidime were found to be the most effective antibiotics against *P. aeruginosa* strains.

Limitation

The limitation of this study is that the viral etiology of CSOM was not investigated. Antibiotic susceptibility to anaerobic bacteria and antifungal susceptibility for fungal isolates could not be performed in this study due to insufficient funds. Hence; in the light of the data mentioned above, we planned this study to evaluate the bacteria most frequently isolated in the bacteriological profile of otitis media patients.

CONCLUSION

In light of the above-obtained results, we conclude that aerobic bacteria are the most common isolates among otitis media patients. Therefore, we recommend evaluating the microbiological profile of these patients and its antibiotic susceptibilities profile for decreasing the potential risk of complications and prevent further emerging antibiotic resistant bacteria.

Author Contributions
Plan and design: IC and MB; Material methods, and data collection: İC, MB, and İİ; Data analysis and comments: MB, IC, BI, and AÖ; Writing, correction, and final version: MB, BI, and AÖ.

Conflict of interest
The authors declare no competing interests.

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