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Copyright AJCEM 2026: <https://dx.doi.org/10.4314/ajcem.v27i2.14>**Short Communication****Open Access****Antibiotic susceptibility of bacteria isolated from suppurative acute otitis media in children in Ouagadougou, Burkina Faso**^{1,3}Tondé, I., ²Guiguemdé, K. T., ^{*,3,4}Condé, M. S., ²Savadogo, P. M., ^{2,3}Sanogo, Z.,
^{1,3}Tapsoba, A., ³Tamboura, M., ^{2,3}Soma, W., ¹Béré, P. L., ³Somé, C. K., ¹Ky/Ba, A.,
¹Sanou, I., and ⁵Gyebré, Y. M. C.¹Laboratory of Bacteriology-Virology, UFR SDS, Joseph Ki-Zerbo Université, Ouagadougou, Burkina Faso²Laboratory of Parasitology-Mycology, UFR SDS, Joseph Ki-Zerbo Université, Ouagadougou, Burkina Faso³Department of Biomedical Analysis Laboratory, Charles de Gaulle Pediatric University Hospital, Ouagadougou, Burkina Faso⁴Department of Biomedical Analysis Laboratory, Ignace Deen University Hospital, Conakry Guinea⁵Department of Otolaryngology, Yalgado Ouédraogo University Hospital, Ouagadougou, Burkina Faso*Correspondence to: mamadisaran93@gmail.com; Tel: (226) 64645543**Abstract:****Background:** Acute otitis media (AOM) is one of the most common bacterial infections in children. The emergence of antimicrobial resistance (AMR) poses a threat to the management of these infections. The objective of this study was to identify and describe the sensitivity profile of bacterial agents isolated in AOM to commonly used antibiotics in the city of Ouagadougou, Burkina Faso.**Methodology:** This was a descriptive cross-sectional study conducted between September 2023 and February 2024 in children aged 0-15 years with clinical features of suppurative AOM seen at the otorhinolaryngology (ORL) departments of four health facilities in Ouagadougou. Ear discharge was collected using sterile swabs and cultured on Chocolate agar media, incubated at 37°C for 24-48 hours in 5% CO₂. The sensitivity of the isolated bacteria to antibiotics was determined using the Kirby-Bauer disc diffusion method and interpreted according to the 2021 guideline of the Antibiogram Committee of the French Society of Microbiology (CA-SFM).**Results:** A total of 61 children with AOM were recruited and bacteriological culture examination was performed on the ear swabs obtained from them. All but two cultures were positive. A total of 59 bacterial pathogens were isolated with Gram-negative bacilli (GNB) more commonly isolated (67.8%, n=40) in the children, dominated by *Klebsiella pneumoniae* (18.6%, n=11) and *Pseudomonas aeruginosa* (18.6%, n=11). Aztreonam and imipenem were the most active antibiotics against GNB, but majority of the GNB were sensitive to gentamicin and ciprofloxacin.**Conclusion:** Acute otitis media in children, combined with the growing resistance of pathogens to antibiotics, is a real public health challenge. It is necessary to strengthen regular microbiological monitoring and the development of appropriate therapeutic strategies in order to limit the emergence and spread of resistant strains.**Keywords:** Acute otitis media; AMR; Antibiotics; Bacteria; Burkina Faso

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Copyright 2026 AJCEM Open Access. This article is licensed and distributed under the terms of the Creative Commons Attribution 4.0 International License <http://creativecommons.org/licenses/by/4.0/>, which permits unrestricted use, distribution and reproduction in any medium, provided credit is given to the original author(s) and the source. Editor-in-Chief: Prof. S. S. Taiwo**Sensibilité aux antibiotiques des bactéries isolées d'otites moyennes aiguës suppuratives chez l'enfant à Ouagadougou, Burkina Faso**^{1,3}Tondé, I., ²Guiguemdé, K. T., ^{*,3,4}Condé, M. S., ²Savadogo, P. M., ^{2,3}Sanogo, Z.,
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¹Sanou, I., et ⁵Gyebré, Y. M. C.¹Laboratoire de Bactériologie-Virologie, UFR SDS, Université Joseph Ki-Zerbo, Ouagadougou, Burkina Faso²Laboratoire de Parasitologie-Mycologie, UFR SDS, Université Joseph Ki-Zerbo, Ouagadougou, Burkina Faso³Département de Biomédecine Laboratoire d'Analyses, Hôpital Universitaire Pédiatrique Charles de Gaulle, Ouagadougou, Burkina Faso⁴Département de Laboratoire d'Analyses Biomédicales, Hôpital Universitaire Ignace Deen, Conakry, Guinée⁵Service d'Oto-rhino-laryngologie, Hôpital Universitaire Yalgado Ouédraogo, Ouagadougou, Burkina Faso*Correspondance à: mamadisaran93@gmail.com; Tél: (226) 64645543

Résumé:

Contexte: L'otite moyenne aiguë (OMA) est l'une des infections bactériennes les plus fréquentes chez l'enfant. L'émergence de la résistance aux antimicrobiens (RAM) constitue une menace pour la prise en charge de ces infections. L'objectif de cette étude était d'identifier et de décrire le profil de sensibilité des agents bactériens isolés dans les cas d'OMA aux antibiotiques couramment utilisés dans la ville de Ouagadougou, au Burkina Faso.

Méthodologie: Il s'agit d'une étude descriptive transversale menée entre septembre 2023 et février 2024 auprès d'enfants âgés de 0 à 15 ans présentant des signes cliniques d'otite moyenne aiguë suppurée (OMA) et suivis dans les services d'oto-rhino-laryngologie (ORL) de quatre établissements de santé à Ouagadougou. Les sécrétions auriculaires ont été prélevées à l'aide d'écouvillons stériles et mises en culture sur gélose chocolatée, incubée à 37°C pendant 24 à 48 heures sous 5% de CO₂. La sensibilité des bactéries isolées aux antibiotiques a été déterminée par la méthode de diffusion sur disque de Kirby-Bauer et interprétée selon les recommandations 2021 du Comité d'Antibiogramme de la Société Française de Microbiologie (CA-SFM).

Résultats: Au total, 61 enfants atteints d'OMA ont été inclus et un examen bactériologique a été réalisé sur les prélèvements auriculaires. Toutes les cultures, sauf deux, étaient positives. Au total, 59 agents pathogènes bactériens ont été isolés, les bacilles Gram négatif (BGN) étant les plus fréquemment isolés (67,8%, n=40) chez les enfants, avec une prédominance de *Klebsiella pneumoniae* (18,6%, n=11) et de *Pseudomonas aeruginosa* (18,6%, n=11). L'aztréonam et l'imipénem se sont révélés les antibiotiques les plus actifs contre les BGN, mais la majorité de ces derniers étaient sensibles à la gentamicine et à la ciprofloxacine.

Conclusion: L'otite moyenne aiguë chez l'enfant, associée à la résistance croissante des agents pathogènes aux antibiotiques, constitue un véritable enjeu de santé publique. Il est nécessaire de renforcer la surveillance microbiologique régulière et le développement de stratégies thérapeutiques appropriées afin de limiter l'émergence et la propagation des souches résistantes.

Mots-clés: Otite moyenne aiguë; résistance aux antimicrobiens; antibiotiques; bactéries; Burkina Faso

Introduction:

Acute otitis media (AOM) is a common ear infection in children, and a major reason for consultation in the ear nose and throat (ENT) and a significant cause of school absenteeism. They affect the middle ear and occur frequently in children aged 0 to 15 years, linked to immune immaturity and the anatomical particularities of the ear in young children (1). In children under five years of age, AOM is the most common infectious disease, ranking fifth among global causes of morbidity and remains more common in developing regions, such as sub-Saharan Africa and South Asia (2). It mainly affects the pediatric population, with a maximum incidence observed between the ages of 6 months and 2 years (3).

An epidemiological survey carried out in Nigeria in 2005 among 600 children aged 0 to 12 years reported a prevalence of AOM estimated at 11.8% (4). In Burkina Faso, a developing country, AOM remains a very common pediatric condition, ranking among the top ten reasons for seeking care in health facilities. According to data from the statistical yearbook of the country's Ministry of Health and Public Hygiene, AOM was the cause of 38,807 cases of hospitalization during the year 2020 (5).

Acute otitis media results from viral and/or bacterial infections. The most frequently isolated bacteria are *Haemophilus influenzae* and *Streptococcus pneumoniae* (6). However, the involvement and emergence of other bacterial pathogens such as *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Staphylococcus aureus* have been repor-

ted in recent years (2). Acute otitis media is an otolaryngological emergency, jeopardizing functional prognosis with an increased risk of deafness and facial paralysis (7).

In current practice, antibiotic treatment is carried out without biological confirmation and without antibiotic susceptibility tests to guide the choice of antibiotics. The most frequently prescribed empirical antibiotic is the combination of amoxicillin and clavulanic acid (8). These practices constitute factors favoring the emergence and spread of antimicrobial resistance (AMR), particularly to antibiotics through selection of mutant strains which constitute a major public health issue. To optimize the prescription and limit the inappropriate use of antimicrobials, it is essential to have updated data on the bacterial etiology of AOM and the sensitivity profile of pathogens to antibiotics.

This study aimed to characterize the bacterial agents involved in AOM in children in the city of Ouagadougou and to describe their sensitivity to common antibiotics.

Materials and method:

Study sites:

The study was conducted in the city of Ouagadougou, capital of Burkina Faso, in four health facilities of different levels and geographical locations. The four sites were the ENT departments of the University Hospital Center (CHU) Yalgado Ouedraogo (CHU YO) in the city Center, the University Hospital Center Pediatric Charles de Gaulle (CHU-P-CDG) in the East, the Medical Center with Surgical Antenna (CMA) of Pissy in the West, and the CMA of Kossodo in the North

of the city. Cytobacteriological analyses were carried out at the CHU-P-CDG laboratory.

Ethical considerations:

The study protocol was submitted for approval to the Ministry of Health's Ethics Committee and received authorization from the administrative managers of the various structures involved in the study.

Study design and period:

This was a descriptive cross-sectional study conducted over a six-month period from September 2023 to February 2024. This period corresponds to the end of the rainy season and the school year for children. It is a period of population movement, which is more significant during the month of December for vacationers. The study ended with a dry period in February.

Study population and participants:

The study population consisted of children aged 0 to 15 years seen in the ENT departments of the four selected sites and who presented with AOM upon clinical examination. The study participants were recruited based on defined criteria, which primarily included age 0 to 15 years.

The clinical diagnosis of acute otitis media (AOM) was made based on the sudden onset of fever associated with ear pain, or on otoscopic examination revealing a congested, opaque, bulging, or perforated eardrum with purulent otorrhea.

Children currently undergoing antibiotic treatment or who had recently used herbal remedies or other local treatments likely to alter the bacterial flora were excluded from the study.

Sample collection:

A bacteriological sample was taken

after obtaining free and informed consent of a parent or legal guardian. Samples of ear discharge were collected using sterile swabs.

Laboratory analysis procedure:

The cytobacteriological analysis of the samples involved macroscopic examination of the sample (appearance, color, consistency); direct microscopic examination after Gram staining, allowing evaluation of the morphology and arrangement of the bacteria; culture of swabs on standard and enriched media, in particular chocolate agar enriched with polyvitamins. The isolated bacteria were identified based on cultural, morphological, biochemical, and antigenic characteristics. Pure cultures were obtained by subculture for the purpose of performing antibiotic sensitivity testing.

The antibiotic sensitivity of the isolated strains was evaluated using the Kirby-Bauer agar diffusion method on Mueller-Hinton agar. The results were interpreted in accordance with the recommendations of the 2021 AntibioGram Committee of the French Society of Microbiology (CA-SFM) (9).

Data analysis:

The data obtained were entered using Excel software and analyzed using Epi info version 7.2 and Stata version 15.1.

Results:

Sociodemographic characteristics of the study participants:

A total of 61 cases of AOM were identified during the study period. The mean age of affected children was 28 ± 29 months, with infants and young children being the most affected, ranging from 1 month to 13 years. Males predominated (55.7%), with a sex ratio of 1.25 (Table 1).

Table 1: Distribution of children with acute otitis media by age group and sex in Ouagadougou, Burkina Faso

Characteristics	Number	Percentage (%)
Age group (months)		
1-20	39	63.9
21-40	11	18.0
> 40	11	18.0
Sex		
Males	34	55.7
Females	27	44.3
Sex ratio	1.25	
Total	61	100.0

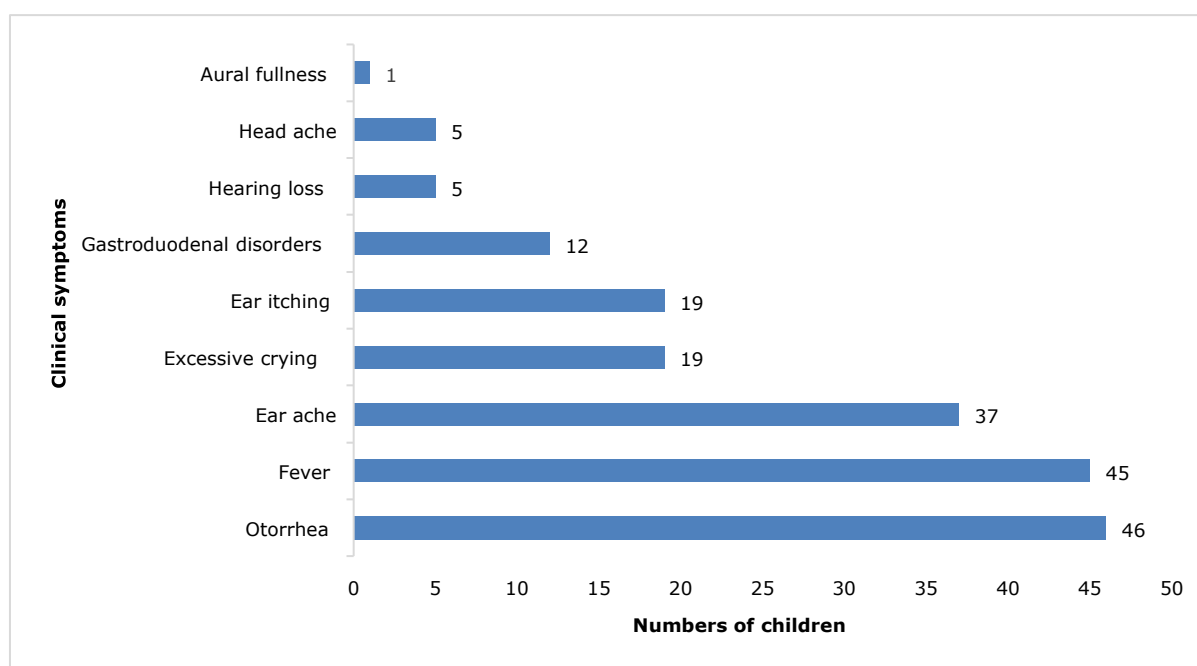


Fig 1: Distribution of clinical symptoms of AOM in children in Ouagadougou, Burkina Faso

Clinical characteristics of study participants:

The clinical manifestations observed during AOM were dominated by otorrhea (75.4%), frequently associated with fever (73.8%) and ear ache (60.7%). This symptomatic triad thus constituted the typical clinical picture suggestive of AOM (Fig 1).

Bacteriological profile of isolated organisms:

Bacteriological analysis showed that a

total of 59 bacterial pathogens were isolated from the participants with a predominance of GNB (67.8%, n=40), dominated by *K. pneumoniae* (18.6%, n=11) and *P. aeruginosa* (18.6%, n=11). Gram-positive cocci (GPC) constituted 32.2% (n=19) of the isolates, dominated by *S. aureus* (11.9%, n=7) and *Staphylococcus epidermidis* (11.9%, n=7) (Table 2).

Table 2: Frequency of isolated bacteria isolates in children with acute otitis media in Ouagadougou, Burkina Faso

Isolated bacteria	Numbers	Percentage (%)
Gram-negative bacilli	40	67.8
<i>Klebsiella pneumoniae</i>	11	18.6
<i>Pseudomonas aeruginosa</i>	11	18.6
<i>Escherichia coli</i>	10	16.9
<i>Proteus mirabilis</i>	5	8.6
<i>Acinetobacter</i> spp	2	3.4
<i>Citrobacter</i> spp	1	1.7
Gram-positive cocci	19	32.2
<i>Staphylococcus aureus</i>	7	11.9
<i>Staphylococcus epidermidis</i>	7	11.9
<i>Staphylococcus saprophyticus</i>	5	8.5
Total	59	100.0

Table 3: Susceptibility of selected Gram-negative bacilli to antibiotics

Antibiotics	<i>Escherichia coli</i> (%) (n=10)	<i>Klebsiella pneumoniae</i> (%) (n=11)
Amoxicillin-clavulanic acid	4 (40.0)	5 (45.5)
Ceftriaxone	5 (50.0)	5 (45.4)
Ceftazidime	6 (60.0)	6 (54.5)
Aztreonam	7 (70.0)	9 (81.8)
Imipenem	10 (100.0)	7 (63.6)
Ciprofloxacin	7 (70.0)	4 (36.4)
Cotrimoxazole	7 (70.0)	5 (45.5)
Gentamicin	8 (80.0)	4 (36.4)

Table 4: Susceptibility of selected Gram-positive cocci to antibiotics

Antibiotics	<i>Staphylococcus aureus</i> (%) (n=7)	<i>Staphylococcus saprophyticus</i> (%) (n=5)
Cefoxitin	4 (57.1)	3 (60.0)
Penicillin G	2 (28.5)	0
Erythromycin	5 (71.4)	3 (60.0)
Lincomycin	5 (71.4)	1 (25.0)
Gentamicin	6 (85.7)	2 (40.0)
Tobramycin	6 (85.7)	1 (25.0)
Kanamycin	5 (71.4)	1 (25.0)
Ciprofloxacin	6 (85.7)	1 (25.0)
Cotrimoxazole	3 (42.8)	2 (40.0)

Antibiotic susceptibility profile of isolated pathogens:

With regard to the sensitivity profiles of GNB, *K. pneumoniae* were sensitive to aztreonam (81.8%, n=9/11) and imipenem (63.6%, n=7/11). *Escherichia coli* isolates were sensitive to gentamicin (80.0%, n=8/10) and cotrimoxazole (70.0%, n=7/10) (Table 3). For the GPC, *S. aureus* isolates were sensitive to erythromycin, cefoxitin, and cotrimoxazole with respective proportions of 85.7% (n=6/7), 57.1% (n=4/7), and 42.8% (n=3/7) (Table 4).

Discussion:

This study provided data on the sensitivity of isolated bacterial pathogens to antibiotics commonly used for treatment of acute

otitis media in children in Burkina Faso. The mean age of children with AOM was 28±29 months, with a strong predominance of infants and young children. This population is more exposed to AOM due to the immaturity of the immune system, in particular, the humoral response, as well as the horizontal and short morphology of the eustachian tube, favoring stasis of secretions and bacterial colonization (10).

The most suggestive clinical sign of AOM was otorrhea. This symptom is common in cases of suppurative AOM with a close relationship between the duration of discharge and the risk of hearing loss (11). The occurrence of this suppuration during the course of AOM could be explained by tympanic perforations associated with post-infectious purulent discharge, by the progression

towards chronicity, but also by exposure to risk factors such as high humidity, household dust and fumes, and inappropriate ear hygiene practices.

Gram-negative bacilli were the predominant bacterial group involved in AOM in this study. This observation had been made by several authors (12-14). Conversely, Wassef et al., (15) found a predominance of *S. aureus* in AOM. This epidemiological divergence could be explained by several factors including the clinical phenotype (series dominated by *S. aureus* often concern non-perforated AOM), sampling methods (middle ear aspiration versus otorrhea logorrheic discharge), prior exposure to antibiotics and the hospital setting. In this present study, the isolation of GNB was probably favored by the frequency of suppurative or perforated forms, and by samples mainly taken from discharges.

In terms of antimicrobial susceptibility, we observed a worrying 40% susceptibility rate of *E. coli* to amoxicillin-clavulanic acid. Although *E. coli* is not a pathogen classically implicated in AOM, this low susceptibility rate should prompt monitoring, as it is part of a documented regional trend. In Ethiopia, several studies have reported very high resistance rates of GNB isolated from otitis media to amoxicillin-clavulanic acid, reaching 66-90% depending on the species and infection sites (16). A study conducted in Ghana in children with suppurative otitis media isolated extended spectrum β -lactamase (ESBL)-producing strains of *E. coli* and *K. pneumoniae* (17). This enzymatic mechanism, responsible for the hydrolysis of penicillins, cephalosporins, and sometimes monobactams, can negate the clinical efficacy of amoxicillin-clavulanic acid and reflects a selection pressure maintained by repeated empirical prescriptions.

In general, African data converge towards a limited efficacy of amoxicillin-clavulanic acid combinations in suppurative otitis, contrasting with better sensitivities to aminoglycosides, fluoroquinolones and certain cephalosporins. These alternatives must be handled with caution in children and taking in to account the administration methods. In our context, the most frequently prescribed antibiotic is amoxicillin-clavulanic acid. The observed resistance of certain bacterial agents to this molecule suggests particular attention during the treatment of AOM not guided by bacteriological data, which may be responsible for therapeutic failures (8).

Conclusion:

Acute otitis media in children and the growing resistance of pathogens to antibiotics constitute a real public health challenge.

The results of this study highlight a predominance of GNB in suppurative infections, highlighting the need for regular microbiological monitoring and the development of appropriate therapeutic strategies, in order to limit the emergence and spread of resistant strains.

Contributions of authors:

All authors contributed to the conception, execution, and writing of the manuscript. All authors have read and approved the final version of the manuscript.

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Conflict of interest

The authors declare that they have no conflicts of interest in relation to the content of this article.

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