

## ORIGINAL ARTICLE

# Childhood suppurative otitis media in Abakaliki: Isolated microbes and *in vitro* antibiotic sensitivity pattern

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## Abstract

**Background:** Suppurative otitis media (SOM) is the most common pediatric problem seen by otolaryngologists in Nigeria. Devising simple and effective ways of treating pediatric patients with suppurating ears, especially in situations without a specialist care, will help prevent chronicity. Our experience with SOM at the Ebonyi State University Teaching Hospital (EBSUTH), Abakaliki, is reviewed in this study. It may serve as a guide in patient care.

**Objective:** Determine the bacteriology of SOM in children in Abakaliki and ascertain their sensitivity to common antibiotics.

**Materials and Methods:** A 2-year retrospective analysis of ear swabs culture results and case files of children aged 0-18 years with SOM managed in EBSUTH.

**Results:** Sixty-five patients with discharging ears were reviewed. Of these, 73% were  $\leq 5$  years, of which 41.5% were infants. About 83% had unilateral ear discharge. Acute suppurative was seen in 67%. Overall swab yield was 87.7%; *Pseudomonas* was (57.4%), *Klebsiella* (16.4%), and *Proteus* species (11.5%).

Ciprofloxacin showed 60% sensitivity, Gentamicin (58%), and Ceftazidime (35%). Amoxicillin/Clavulanic acid, ceftriaxone, and cefuroxime showed sensitivity of 4.3%-9.7%.

**Conclusions:** Treatment protocols of SOM in children should emphasize the use of Ciprofloxacin or Gentamicin, especially in situations with limited access to laboratory services or specialist care.

**Key words:** Antibiotics, bacteria, childhood sensitivity, suppurative otitis media

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## Introduction

A suppurating ear commonly follows a delay in the diagnosis or inadequacy of treatment of acute otitis media (AOM)<sup>[1]</sup> Less commonly, it may complicate otitis media with effusion (OME) and perforation of the tympanic membrane.<sup>[2-4]</sup> Suppurative otitis media (SOM) is the most common pediatric problem seen by otorhinolaryngologists in Nigeria.<sup>[3,5,6]</sup>

The World Health Organization (WHO) estimates that each year 51,000 children aged below 5 years die from complications of the otitis media in developing countries.<sup>[4,7]</sup>

Chronic SOM (CSOM), ie, suppurative of more than 8 weeks,<sup>[6,8]</sup> is recognized as an important cause of preventable

hearing loss in the developing world. Its association with hearing impairment, death, and severe disability due to central nervous system involvement and the high cost incurred in its management, make CSOM a significant health problem in developing countries.<sup>[9,10]</sup> The WHO has classified Nigeria as a country with high CSOM prevalence of 2%-4%<sup>[10]</sup> There is a need for prompt diagnosis and treatment of an episode of acute SOM (ASOM) if progression to chronicity can be minimized.

A review of recent literature shows that though the causative agents of this disorder have not changed much

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over the years, the antibiotics sensitivity pattern of these bacteria has changed tremendously.<sup>[7,11,12]</sup> This study reviews our experience with SOM at the teaching hospital in Abakaliki. Our aim, therefore, is to determine the current bacteriology of SOM and the sensitivity pattern of these microbes. We hope that the knowledge will guide clinicians to opt for effective antimicrobial agent in the absence of a specialist personnel or laboratory confirmation of the causative microbes in pediatric draining ears.

## Materials and Methods

This is a retrospective analysis of the results of ear swabs and case files of children aged 0-18 years with SOM performed at the microbiology laboratory of EBSUTH, Abakaliki, within a 24-month period from January 2006 to December 2007.

EBSUTH is one of the two tertiary health Institutions in Ebonyi State, which also serves parts of the neighboring states of Benue, Cross River, Akwa Ibom, and Enugu. It is situated in Abakaliki, a fast urbanizing state capital with a mixed population of peasant farmers, traders, and civil servants. Significant proportions of patients seen at the hospital are uneducated peasant farmers and traders. It has a 250-bed capacity and sees about 5,000 children annually at the children outpatient clinic. The nascent Ear, Nose and Throat (ENT) clinic has a part-time specialist who visits twice weekly. In his absence, children with suppurating ears are usually seen first by the pediatricians.

An analysis was done of the laboratory records of ear swabs collected from patients with draining ears from both the pediatric out-patient and ENT clinics aged 0-18 years. The laboratory scientist provided detailed information on the laboratory procedures employed as follows: Swabs were collected in the laboratory by the laboratory scientist. One swab was collected per patient even in those discharging bilaterally. Each swab was inoculated into blood, chocolate, and MacConkey agar plates. The blood and chocolate plates were inoculated in duplicates. Each respective pair and MacConkey agar plate were incubated aerobically, while the other pair was incubated overnight under increased CO<sub>2</sub> atmosphere at 37°C.

The isolates were identified using standard bacteriological methods,<sup>[13]</sup> and the antimicrobial sensitivity pattern determined by using the Strokes disc diffusion method. Focus was on the antibiotics that produced zones of inhibition of 11 mm diameter and above when tested against the isolates individually. The isolated microbes as well as their sensitivity patterns were noted with emphasis on the most sensitive and least sensitive drugs. The isolated microbes were grouped on duration of discharge: <2 months is considered acute, while ≥2 months is considered chronic.

The case notes of the patients were reviewed and relevant information extracted as follows: Age and sex, duration of discharge, treatment received prior to presentation, and associated complications.

## Results

A total of 65 patients with discharging ears were reviewed. Table 1 highlights the demographic and clinical characteristics of these patients. Thirty-nine (60.0%) were males, while 26 (40.0%) were females giving a M: F ratio of 1.5:1. Forty-seven (72.3%) children were ≤5 years, of which 27 (41.5%) were infants. Fifty-four children (85.7%) had unilateral ear discharge, an in 33 (52.4%) of them the left ear was more commonly affected. The records of the site of discharge of 3 children (4.6%) were not available. Forty-four patients (67.7%) presented within 2 months of the onset of discharge (acute).

Table 2 shows the microbial yield of the ear swabs of children with SOM. Sixty-five ear swabs were cultured, of which 57 (87.7%) yielded isolates while 8 (12.3%) did not yield any isolate. Fifty-three (81.5%) of the swabs yielded single isolates and 4 (6.2%) had two isolates each. Similar isolates were recovered in acute (<2/12) as well as chronic (≥2/12) ear discharges with *Pseudomonas* being the most common [35 (57.4%)] followed by *Klebsiella* species [10 (16.4%)], and *Proteus* species [7 (11.5%)].

Sensitivity pattern of the isolates against some common antibiotics is shown in Table 3. Only Ciprofloxacin and Gentamicin showed sensitivity of ≥50%. Erythromycin, Cefuroxime, and Amoxicillin/Clavulanic acid show very low sensitivity of 14%, 12%, and 7%, respectively.

**Table 1: Demographic and clinical characteristics of the subjects**

	Frequency (N = 65)	%
Age (years)		
≤1	27	41.5
1-5	20	30.8
6-10	10	15.4
11-15	6	9.2
16-18	2	3.1
Sex		
M	39	60
F	26	40
Duration of discharge (month)		
≤2	44	67.7
>2	21	32.3
Discharging ear		
Bilateral	08	12.3
Left	33	50.7
Right	21	32.3
Unknown	03	4.6

**Table 2: Bacterial isolates from ear discharges of children at EBSUTH**

Organisms	Duration of ear discharge		Total (%)
	<2 month (%)	≥2 month (%)	
Gram negative			
<i>Pseudomonas</i> species	24 (39.34)	9 (14.75)	35 (57.38)
<i>Klebsiella</i> species	6 (9.83)	4 (6.56)	10 (16.39)
<i>Proteus</i> species	5 (8.20)	2 (3.28)	7 (11.48)
<i>Escherichia coli</i>	2 (3.28)	0 (0.0)	2 (3.28)
Gram Positive			
<i>Staphylococcus aureus</i>	2 (3.28)	1 (1.64)	3 (4.92)
<i>Streptococcus pneumoniae</i>	2 (3.28)	0 (0.0)	2 (3.28)
<i>Streptococcus pyogenes</i>	3 (4.92)	0 (0.0)	3 (4.92)
Total	44 (72.13)	17 (27.87)	61 (100)

EBSUTH : Ebonyi State University Teaching Hospital

**Table 3: In vitro antibiotics sensitivity pattern of microbes isolated in suppurative otitis media at EBSUTH**

Drugs	Total no. of isolates tested	No. of sensitive	No. of resistant	% Sensitivity
Ciprofloxacin	50	30	20	60
Gentamicin	52	30	22	58
Ceftazidime	20	7	13	35
Ofloxacin	42	13	29	32
Perfloxacin	23	5	18	22
Ceftriaxone	41	9	32	22
Erythromycin	35	5	30	14
Cefotaxime	37	4	33	11
Cefuroxime	47	6	41	12
Augmentin	43	3	40	7

EBSUTH : Ebonyi State University Teaching Hospital

## Discussion

Most patients with draining ears in this study were aged below 5 years (72.3%), with a majority having the disease during infancy, hence reflecting the early onset of ear infection in children. Other workers in Nigeria have also reported high affectation of children with SOM.<sup>[3,6,11,14]</sup>

Thirty-three percent of the patients had ear discharge for over two months before presentation. This reflects the health seeking habit of the patients and, possibly, the absence of accessible and effective healthcare services. Such late presentations with its attendant complications of impaired hearing, death, and severe disability from the involvement of CNS as well as the cost of treating this condition make a chronic suppurating ear a significant health problem in resource poor countries like Nigeria.<sup>[10]</sup>

Thirteen percent of patients had bilateral ear discharge, which was low compared to the findings of Ibekwe<sup>[3]</sup> and Okafor<sup>[11]</sup> that recorded 49.5% and 44.3%, respectively. This difference may be attributed to the use of laboratory

data rather than clinic attendance in this study, as some patients may not undertake laboratory investigations due to financial constraints.

The finding of predominance of Gram-negative organisms *Pseudomonas aeruginosa*, *Klebsiella*, and *Proteus* in ear swab results and the similarity of findings in both acute and chronic discharges had been reported by previous researchers in Nigeria.<sup>[11,12,14]</sup> The relative rarity of bacteria that were previously associated with ASOM, *Streptococcus pneumoniae* (3.3%) and *Staphylococcus aureus* (4.9%), in this report had also been previously highlighted in Nigeria.<sup>[11,12,14]</sup> This may be a reflection of the limitations of the retrospective study design wherein the period of onset of the ear discharge may not be accurately recalled or the acute-on-chronic ear discharge is taken by the patient and clinician to be AOM.

The sensitivity of the agents of SOM to the quinolones has been highlighted by various authors.<sup>[6,9,12,15]</sup> Ciprofloxacin showed the highest sensitivity of 60% to the isolated organisms in this study, followed by gentamicin (58%). The aminoglycosides (especially gentamicin) have remained sensitive over the years, as also shown in this study. The relative resistance of these organisms to the commonly used antibiotics like erythromycin, cefuroxime, and augmentin (amoxicillin and clavulanic acid) gives a cause for concern.

There is a need to devise a simple and effective means of treating an acute suppurating ear in centers in Nigeria without easy access to specialist care to minimize progression to chronicity caused by its attendant social and neurological complications. Sub-Saharan Africa is said to have one otolaryngologist per million population.<sup>[10]</sup>

From this study, ampicillin/clavulanic acid, erythromycin, and cefuroxime, which were previously effective and in regular use, have shown reduced sensitivity, and hence may not serve as first-line drugs anymore. Use of ciprofloxacin and gentamicin as first-line drugs in treatment of a suppurating ear, especially in the acute phase should be encouraged. The setback with gentamicin remains its systemic route of administration. However, the WHO and various otorhinolaryngologists have highlighted the importance of topical ear drops in the management of a suppurating ear. With the emergence of ototopical fluoroquinolones, the shortcomings of ototoxicity as feared with the aminoglycosides has been reduced drastically.<sup>[10,16]</sup> Together with aural toileting, topical quinolones have been effective in treating an uncomplicated suppurating ear even in the absence of systemic antibiotics.<sup>[10,15]</sup> This option appears feasible in our environment where access to and cost of laboratory services may be out of reach of many of these patients.

Bearing in mind that successful topical therapy consists of three important components: Selection of an appropriate

antibiotics ear drop, regular meticulous aural toileting, and control of granulation tissue formation, there is a need for effective monitoring of patients on otological antibiotics therapy. The first two tasks can be easily accomplished by a clinician who is not an otolaryngologist. The presence of granulation tissue will result in persistent otorrhea, in which case, the patient must be referred to an otorhinolaryngologist for management.

The importance of health education cannot be overemphasized here, as most patients need to be trained for wicking of the ear and proper antibiotics instillation to reach middle ear structures. The need to prevent water from entering the middle ear cavity of patients with tympanic membrane perforation through the external auditory canal should also be emphasized. This can be accomplished by plugging the external auditory canal with a piece of cotton wool impregnated with petrolatum jelly (eg, *Vaseline* petroleum jelly) when the patient is bathing or out in the rain. For the same reason, patients are discouraged from swimming.

Training of healthcare providers in Primary Ear Care would probably reduce the incidence of suppurating ears in our environment. The WHO puts the global burden of illness from CSOM at about 65-330 million individuals with draining ears, 60% (39-200 million) of whom suffer from significant hearing impairment. Most of these are found in the developing world, Nigeria inclusive,<sup>[10]</sup> and usually starts in childhood. CSOM is a disease of poverty and overcrowding.<sup>[5,10,16]</sup> Therefore, improvement in hygiene, housing, and nutrition will probably reduce its prevalence as has been demonstrated in Maori children between 1978 and 1987.<sup>[1,11]</sup>

Ultimately, the reduction in the burden of CSOM would depend on the ability of the healthcare system to provide timely and accessible ear care services whenever a child develops AOM, to prevent recurrences and progression to CSOM.<sup>[1]</sup>

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