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Aetiologic Agents of Otitis Media in Benin City, Nigeria

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Abstract: Otitis Media continues to be a major presentation in the ear, nose and throat clinic. This study aimed to isolate, characterize and identify the bacteriological and mycological aetiologic agents of otitis media in University of Benin Teaching Hospital, Benin City, Nigeria. Ear discharge from 569 (299 males and 270 females) patients diagnosed clinically of otitis media between August 2009-August 2010 were processed using standard bacteriological techniques to recover the bacterial and fungal aetiologic agents. Antibiotic Susceptibility test was performed on all bacterial isolate using the Kirby Bauer disc diffusion technique. *Pseudomonas aeruginosa* (28.3%) was the predominant bacteria isolate causing otitis media followed by *Staphylococcus aureus* (21.0%), *Klebsiella* sp. (8.9%), *Proteus* sp. (8.2%), *Alkaligenes* sp. (4.3%), *Streptococcus pneumoniae* (3.9%), *Escherichia coli* (3.0%) and *Citrobacter freundi* (1.7%). Fungi isolated were *Aspergillus niger* (9.2%), *Candida albicans* (5.4%), *Candida tropicalis* (3.0%), *Aspergillus flavus* (2.1%) and *Candida parasilopsis* (1.5%). About 413 had a single organism isolated from the middle ear culture while 20 (3.51%) patients had mixed organisms isolated. Infection was highest among 0-5 years and lowest among aged 18-23. Gender did not affect the distribution of pathogens ($p>0.05$). All bacterial isolates were poorly susceptible to the antibacterial agents. The study uncovers a high frequency of bacteria associated otitis media with the finding of fungi too as a significant aetiologic agent.

Key words: Bacteriological aetiologic agent, *C. tropicalis*, significant, culture, patients, Nigeria

INTRODUCTION

Otitis media is highly prevalent worldwide. Otitis media is inflammation of the middle ear drum and the inner ear including a duct known as the Eustachian tube (Arroll, 2005). Otitis media is very common in children (Li *et al*., 2001).

Children below the age of 7 years are much more susceptible to Otitis Media (OM) since the Eustachian tube is shorter and at more of a horizontal angle than in the adult and this is also because they have not developed the same resistance to bacteria, fungi and viruses as found in adults (Weiner and Collison, 2003). Exposure to smoke crowded living conditions and low socio-economic class are among the risk factor of otitis media (Aich *et al*., 2009).

Over 50% of the cases of otitis media are caused by bacteria. Occasionally, otitis media may be caused by fungi, viruses, *Mycoplasma pneumoniae* and *Chlamydia trachomatis* (Block, 1997). A number of studies have reported on the prevalence of otitis media (Minja and Machemba, 1996; Aich *et al*., 2009). However, majority of these studies have focused on clinical diagnosis with little or no report on the bacteriological and mycological aetiology of otitis media.

There exists a dearth of knowledge on a study carried out in this area on the prevalence of otitis media incorporating bacteriological and mycological examination.

Against this background, this study aimed to isolate, characterize and identify the bacteriological and mycological aetiologic agents of otitis media in Benin city.

MATERIALS AND METHODS

This study was carried out during the period August 2009-August 2010 at the Ear, Nose and Throat Clinic in University of Benin Teaching Hospital, Benin city, Nigeria. About 569 patients with clinical manifestations suggestive of Otitis Media (Discharging ears) (299 males and 270 females) were investigated. The age range of patients was (0-70 years).

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Collection of specimens: The samples were collected with sterile swab sticks which were properly labeled for each patient. The swab sticks were taken to the Medical Microbiology Laboratory, University of Benin Teaching Hospital for analysis within 4-6 h after collection.

Isolation of bacteria: Specimens were inoculated onto blood, chocolate and MacConkey agar plates. All plates were incubated for 24 h aerobically with the exception of chocolate agar that was incubated in a candle jar. Emergent colonies were identified according to standard bacteriological methods (Cowan, 1974). Disc susceptibility test was performed according to National Committee for Clinical Laboratory Standards (NCCLS) (National Committee for Clinical Laboratory Standards, 1993).

Isolation of fungi: The swab sticks were streaked directly on the well labeled Sabouraud Dextrose Agar (SDA) plates and incubated at room temperature. The growth was identified based on their morphological and cultural characteristics and microscopic examination was done using lactophenol blue staining technique (Collins and Lyne, 2000). Germ tube method and clamidospore formation where used to differentiate *Candida albicans* from other species of *Candida*. API 20C (Biomerieux France) was also used for the speciation of *Candida*. Statistical analysis was done by χ^2-test using SPSS v 16 software.

RESULTS AND DISCUSSION

From the 569 patients enrolled in the study, there were 466 isolates. About 413 patients (72.6%) had a single organism isolated from the middle ear culture while 20 (3.51%) patients had mixed organisms isolated. *Pseudomonas aeruginosa* was the most prevalent aetiologic agent of otitis media while the least was *Candida parasilopsis* (Table 1). Patients that were 5 years or younger had significantly higher prevalence of otitis media compared with other children and adults but there was no significant difference in gender in the prevalence of otitis media (Table 2). The antibiotic susceptibility profile of the bacteria isolates revealed high level resistance (Table 3). Lincomycin, Erythromycin, Ampicillin and Tetracycline were not active against any of the bacterial isolate.

Otitis media is frequently encountered in tropical and subtropical areas (Yehia *et al*., 1990). Diagnosis of this disease is often based solely on the clinical symptoms. The objectives of this study were to determine the prevalence, bacterial and fungal aetiologic agents associated with Otitis media in Benin city, Nigeria. Otitis media was found in (76.1%) of cases of patients presenting with clinical manifestations of otitis media from a total of 569.

It has been reported that children <5 years are more prone to otitis media due to shorter and more horizontal Eustachian tube, lower immunity of children compared to adults and the fact that bacteria adhere better to epithelial cells of children that adults (Li *et al*., 2001; Weiner and Collison, 2003; Egbe *et al*., 2010).

Table 1: Prevalence of bacterial and fungal aetiologic agents of otitis media

Organisms isolated	Total number of isolates (%)
Staphylococcus aureus	98 (21.0)
Streptococcus Pneumoniae	18 (3.9)
Klebsiella sp.	40 (8.9)
Proteus sp.	38 (8.2)
Pseudomonas aeruginosa	132 (28.3)
Escherichia coli	14 (3.0)
Alkaligenes sp.	20 (4.3)
Citrobacter freundi	8 (1.7)
Aspergillus niger	43 (9.2)
Candida albicans	25 (5.4)
Candida tropicalis	14 (3.0)
Candida parasilopsis	7 (1.5)
Aspergillus flavus	10 (2.1)
Total	466.0

Table 2: Gender and age related prevalence of otitis media

Sex	No. tested	No. infected (%)
Males	293	218 (74.4)
Females	276	213 (77.1)
Age (years)		
0-5	193	185 (95.9)
6-11	97	79 (81.4)
12-17	73	60 (82.2)
18-23	85	32 (37.7)
24-29	40	20 (50.0)
30-35	40	31 (77.5)
>36	41	26 (63.4)

Table 3: Susceptibility of the bacterial isolates to antibiotics

Organisms No.	CIP	CN	CAZ	L	AMX	E	AUG	AMP	TE	OXC
Staphylococcus aureus (98)	53 (54.1)	35 (35.7)	49 (50.0)	0	0.0	0	21 (21.4)	0	0	16 (16.3)
Streptococcus pneumoniae (18)	9 (50.5)	7 (38.9)	14 (77.7)	0	1 (5.6)	0	11 (61.1)	0	0	2 (11.1)
Klebsiella sp. (40)	16 (40.0)	8 (20.0)	13 (32.5)	0	0.0	0	7 (17.5)	0	0	0.0
Proteus sp. (38)	11 (28.9)	6 (15.8)	(15.8)	0	0.0	0	3 (7.9)	0	0	0.0
Pseudomonas aeruginosa (132)	91 (68.9)	23 (17.4)	43 (32.6)	0	0.0	0	0.0	0	0	0.0
Escherichia coli (14)	8 (57.1)	2 (14.3)	6 (42.9)	0	0.0	0	4 (28.6)	0	0	0.0
Alkaligenes sp. (20)	7 (35.0)	5 (25.0)	3 (15.0)	0	0.0	0	2 (10.0)	0	0	0.0
Citrobacter freundi (8)	4 (50.0)	1 (12.5)	2 (25.0)	0	0.0	0	1 (12.5)	0	0	0.0

CIP-Ciprofloxacin, CN-Gentamycin, CAZ-Ceftazidime, L-Lincomycin, AMX-Amoxicillin, E-Erythromycin, AUG-Augmentin, AMP-Ampicillin, TE-Tetracycline, OXC-Oxacillin

This was observed in this study as children 5 years and younger had a higher prevalence of otitis media (95.9%). In this study there was no significant difference between male and female patients in the prevalence of otitis media (74.4, 77.1%), respectively. This result is in agreement with others. Still others showed that the male gender was a significant risk factor for otitis media (Egbe *et al*., 2010).

The most common pathogen isolated from the ear canal of patients with otitis media is bacteria. *Pseudomonas aeruginosa* was the predominant isolate causing otitis media generally. This is in agreement with previous studies in Nigeria (Nwabuisi and Ologe, 2002; Egbe *et al*., 2010) but differs from studies in developed countries were *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Moraxella catarrhalis* predominate (Bluestonem *et al*., 1992; Brook and Gober, 1998). Other bacteria isolates recovered in descending order were *Staphylococcus aureus*, *Klebsiella* sp., *Proteus* sp., *Streptococcus pneumoniae*, *Escherichia coli*, *Alkaligenes* sp. and *Citrobacter freundi*.

Fungal species with the highest frequency was *Aspergillus niger* while the fungi with the lowest frequency were *Candida albicans*, *Aspergillus flavus*, *Candida tropicalis* and *Candida parasilopsis*. *Aspergillus niger* is an opportunistic filamentous fungi, it has been identified as the cause of bilateral otomycosis (Gugnai *et al*., 1989). *Aspergillus niger* grows on cerumen, epithelial scales and detritus deep in the external canal. The resulting accumulation of these inflammatory materials along with cerumen and fungal debris result in plug formation which is extremely significant and usually leads to diminished hearing ability; pruritis, irritation of the surface layer of the external ear itself is a predisposing factor for bacterial colonization. There may be superficial erosion of membranes.

The susceptibility profile of the bacteria isolates recovered revealed high level resistance. Prescriptions of antibiotics without laboratory guidance as well as over the counter sales of antibiotics without prescription is common in the Nigerian setting and have been suggested as possible reasons for increase resistance observed in the country (Okeke *et al*., 1999; Omoregie and Eghafona, 2009).

CONCLUSION

In this study, an overall prevalence of 76.1% of otitis media was observed among patients clinically diagnosed of otitis media in patients attending the ear, nose and throat clinic in University of Benin Teaching Hospital, Benin city, Nigeria. *Pseudomonas aeruginosa* and *Aspergillus niger* was the predominant bacterial and fungal isolate causing otitis media. Susceptibility rates to antibiotics were generally poor.

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