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A STUDY OF BACTERIAL ISOLATES IN CASES OF OTITIS MEDIA IN PATIENTS ATTENDING OAUTHC, ILE-IFE

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ABSTRACT

Bacteriology examinations were carried out on one hundred and seven (107) ear swabs of patients attending Ear, Nose and Throat (ENT) clinic as well as those sent to Medical Microbiology and Parasitology department of Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) Ile-Ife between February 2004 and January, 2005. Of the one hundred and seven ear swabs from patients in all age groups and had been provisionally diagnosed of Otiti Media (OM), ninety three ((93) specimens yielded growth out of which eleven (11) showed mixed bacterial growth. A total number of one hundred and four (104) isolates were recorded with the following prevalence. Pseudomonas aeruginosa accounting for the highest 40 (38.5%), Staphylococcus aureus 32 (30.8%), Proteus mirabilis 16 (15.4%) Klebsiella species 12 (9.6%) and E.coli 4 (3.8%). Eighty (76.9%) cases occurred in children of 0-14 years of age while twenty four (23.1%) occurred in older age. This difference is statistically significant (P<0.05) using the T-test. Only the common forms of Otitis Media cases were seen in this study which included Acute Otitis Media (AOM), Acute suppurative Otitis Media (ASOM) and Otitis Media with Effusion (OME). The in-vitro antibiotic susceptibility tests showed that the isolates were more sensitive to Gentamicin (33.3% - 100%) and Ofloxacin (25% - 100%) than to other drugs tested. This work has further confirmed the diverse nature of bacterial aetiology of otitis media and revealed their high resistance to the commonly used antibiotics. This consequently underscores the need for culture and antibiotic susceptibility in the management of OM.

Keywords: Otitis media, bacteriology, anitibiotic susceptibility

INTRODUCTION

Otitis media as described by Sehnert (1) and Michael et al (2) is the inflammation of the middle ear. It often results from dysfunction of the Eustachian tube (ET) while other sources of ear contamination are from infected water during bath or swimming, vomiting or aspiration of food or drink due to palatal paralysis and milk feed of infants held in horizontal position among others.

OM is seen in all age groups but has been reported to be more prevalent in infants and Children (2-4). Symptoms associated with OM include pain, fullness of the ear, fever, headache, anorexia, irritability, vomiting and diarrhea. There may be a discharge from the middle ear. Infants with OM intermittently touch their ears while most of them have nasal congestion. Meningitis can complicate OM on rare occasions and Elaine et al (5) have shown that deficiency in phonological skill often follows in children with recurred or persistent OM. Furthermore, infections may result in loss of hearing in a high percentage of children below 3 years of age (1).

A Racial prevalence had earlier been reported to exist while a recent study that control socio-economic and other factors showed equal incidence in black and white races(6)

The pathogens most frequently encountered in cultures of ear infections are Pseudomonas spp., Staphylococcus anreus, Proteus spp., Streptococcus spp. Haemophilus spp., and coliforms (7 – 11) with varying prevalence.

Ikeh et. Al (12) incriminated Corynebacterium diphtheriae, Actinomyces isrealii,

Mycobacterium tuberculosis in their findings while Bailey and Scoth (7) had earlierreported other Mycobacteria and ycoplasma pneumoniae. A recent report by Hiroshi et al (13) implicated Chlamydial pneumonia.

It is assumed that knowledge of the occurrence rate, the nature and type of organisms incriminated in the various forms of Otitis Media will go a long way in helping to choose the type and duration of therapy so that relapse rate will be reduced and cure will be automatically effective.

Though the treatment of OM is controversial and subject to change particularly in the developing countries, the antibiogram of these organisms has been reported to vary with time and geographical area as well as continent to continent, probably due to the use and abuse of antibiotics among other factors. Hence the need for periodic update of antibiogram for effective chemotherapy and management of OM cannot be overemphasized. Therefore this study was undertaken to know the new trend of prevalence and antibiogram profiles of bacteria agents of OM in our community.

MATERIALS AND METHODS

Study Design:

All cases of provisionally diagnosed otitis media (OM) at the ENT clinic of OAUTHC as well as those sent to the Medical Microbiology and Parasitology department of OAUTHC between February 2004 and January 2005 were studied and swabs were obtained. There was no age or sex barrier as all individuals of any age group presented with cases of OM were included in this study. The study included the documentation of age and sex of the patients.

Sample Collection:

A total number of one hundred and seven (62 males and 45 females) ear swab samples were collected from neonates, children, adults of all age groups presenting with various forms of OM as earlier explained. None of these patients had been on any antibiotics therapy prior to the collection of specimens. Before sample collection, the external ears were cleansed with sterile cotton swabs moistened with sterile normal saline Processing of Samples:

All samples were inoculated on blood agar (BA) chocolatre agar (CA) and MacConkey agar (MCA) plates before smears for Gram staining were made on clean microscope slides. The BA and MCA plates were incubated aerobically at 37^0C for 24 hrs while the CA plates were incubated under 5% CO_2 at 37^0C for 24hrs. the growths were examined macroscopically and biochemically to identify the isolates as recommended by Cowan and Steel (14). Antibiotic sensitivity was performed on the isolates and identified organisms by the disc diffusion method using Diagnostic Sensitivity Test (DST) agar as described by Stokes and Ridway (15). Control organisms used were Stephylococcus auteus (NCTC 6571), E. coli (NCTC 10418) and Pseudomonas (NCTC 1066)

RESULTS

From the 107 ear swabs processed, 93 representing 86.9% yielded bacterial growth while 14 (13.1%) showed no growth. Of the 93 growth, 11 (11.8%) showed mixed bacterial growth. One hundred and four (104) isolates were recorded with Pseudomonas aeruginosa accounting for the highest percentage occurrence 40 (38.5%) and the lowest with E.coli 4 (3.8%) as seen in table 1. Other predominant isolates include S.aurens 32 (30.8%), Klebsiella spp 12 (9.6%) and Proteus mirabilis 16 (15.4%).

The distribution of isolates in relation to Gram reaction as presented in table 1 shows that Gram

negative organisms were more prevalent than Gram positive organisms 72 and 32 respectively. Prevalence of pathogens in relation to sex as seen in table 2 shows a ratio of male to female to be 44:49 (1:1.11) that is not significantly different.

The prevalence of OM among different age groups is shown in table 3 with 80 (76.9%) occurring in children (0-14yrs). This indicates a statistically significant difference ($P<0.05$) using T-test between prevalence of OM in children (0-14yrs) in comparison with older ages.

Pie chart showing the frequency of isolates is shown in table 4

The antibiotic susceptibility pattern of the various isolates is presented in table 5.

The most prevalent organism, P.aeruginosa shows a high susceptibility to Gentamycin (80%) and ofloxacin (70%) and the only Gram positive organism S.aureus showed moderate sensitivity to erythromycin (75%) Gentamycin (62.5%) and Streptomycin (65.6%). It should be noted that S.aureus showed resistance to penicillin.

Table 1: Prevalence of pathogens in relation to sex and Gram reaction

ISOLATES	FREQUENCY (%)[A]	MALE N(%)[B]	FEMALE N(%)[B]
GRAM NEGATIVE BACTERIA			
PSEUDOMONAS AERUGINOSA	40 (38.5)	28 (70.0)	12 (30.0)
PROTEUS MIRABILIS	16 (15.4)	8 (50.0)	8 (50.0)
KLEBSIELLA SPECIES	12 (11.5)	0 (0)	12 (100)
ESCHERICHIA COLI	4 (3.8)	4 (100)	0 (0)
TOTAL	72 (68.2)		
GRAM POSITIVE BACTERIA			
STAPHYLOCOCCUS AUREUS (87.5)	32 (30.8)	4 (12.5)	28
GRAND TOTAL	104 (100)	44 (42.3)	60 (57.7)

[A]PERCENTAGE BASED ON TOTAL NUMBER OF ISOLATES

[B]PERCENTAGE BASED ON DISTRIBUTION OF STRAINS OF EACH ISOLATES BY SEX OF PATIENTS

Table 2: Sex pattern of positive culture

SEX	NO	%
MALE	44	47.3
FEMALE	49	52.7
TOTAL	93	100.0

Table 3a: Age distribution of otitis media cases and bacterial isolates

AGE RANGE		CHILDREN 0-14YRS	ADULT >14YRS
ISOLATES	FREQUENCY	N (%)	N(%)
PSEUDOMONAS AERUGINOSA	40	28 (70)	12 (30)
STAPHYLOCOCCUS AUREUS	32	24 (75)	8 (25)
PROTEUS MIRABILIS	16	16 (100)	0 (0)
KLEBSIELLA SPECIES	12	8 (67)	4 (33.3)
ESCHERICHIA COLI	4	4 (100)	0.(0)
TOTAL	104	80 (76.9)	24 (23.1)

Table 3b: Bacterial isolates from Children and Adults.

ISOLATE	**FREQUENCY**	**ANGLE SUBS TENDED**
PSEUDOMONAS AERUGINOSA	40	40/104 x 360/1 = 138.5°
STAPHYLOCOCCUS AUREUS	32	32/104 x 360/1 = 110.8°
PROTEUS MIRABILIS	16	16/104 x 360/1 = 55.4°
KLEBSIELLA SPECIES	12	12/104 x 360/1 = 41.5°
ESCHERICHIA COLI	4	4/104 x 360/1 = 13.8°
TOTAL	104	360°

P.AERUGINOSA 138°

KLEBSIELLA SP. 41.5°

P.MIRABILIS 55°

S.AUREUS 110.8°

E.COLI 13.8°

Table 4: Pie chart showing the frequency of isolates

	PSEUDO SPP	*S.AUREUS*	*PROTEUS SPP*	*KLEB SPP*	*E.COLI*
TOTAL NO. OF ISOLATES	40	32	16	12	4
ANTIBIOTICS	N(%)	N(%)	N(%)	N(%)	N(%)
OFLOXACIN (OFL)	28(70)	8(25)	16(100)	0(0)	4(100)
COTRIMOZAXOLE (COT)	16 (40)	8 (12.5)	0(0)	0(0)	0(0)
GENTAMICIN (GEN)	32(80)	20(62.5)	0(0)	4(33.3)	0(0)
CEFUROXINE (CXM)	4(10)	0(0)	0(0)	0(0)	0(0)
STREPTOMYCIN (STR)	0(0)	21(65.5)	0(0)	0(0)	0(0)
CHLORAMPHENICOL (CHL)	0(0)	16(50)	0(0)	0(0)	0(0)
PENICILLIN (PEN)	0(0)	0(0)	0(0)	0(0)	0(0)
ERYTHROMYCIN (ERY)	0(0)	24 (75)	0(0)	0(0)	0(0)

DISCUSSION

Most of the patients seen in this study had the various common forms of OM ranging from AOM, ASOM, CSOM to OME which usually follow poorly managed or untreated OM.

The observed prevalence of 38.5% 30.8% and 15.4% for P.aeruginosa, S.aureus and P.mirabilis respectively correlates with those of Devan et al (16) who reported 48% and 22% for P.aeruginosa and Proteus spp respectively while Ogisi and Osamor (10) recorded prevalence of 31% and 24% for Pseudomonas spp and Proteus spp respectively. This is however in contrast to the findings of Watson (17) and Michael et al (2) who recorded Haemophilus influenza, Streptococcus pneumonia and Moraxella catarrhalis as predominant organisms for OM cases. However, results from this work agrees with that of Azeez (18) who reported P. aeruginosa, S. aureus and Proteus spp in his work at Oyo (Nigeria) while Brobby and Zachik (19) had earlier concluded that H.influenza and S. pneimoniae do not play important role in the pathogenicity of OM in the topics.

Brobby (4) and other authos (1, 7, 10, 19) have reported that the aetiologic organisms of OM vary from continent to continent i.e. locality to locality. This variations can be attributed to the emergence of increasing antimicrobial resistance, difference in social cultural practices, nutrition and socio-economic factors among others. The diverse nature of bacterial aetiology of OM reported in this study therefore confirms previous studies.

In line with this study, Hashisaki (20) reported Paeruginosa as the most commonly recovered organism from the chronically draining ear while other researchers have also recorded high prevalence of P.aeruginosa 48%, 38% and 31% by Devan et.al.. (16), Coker et al. (11) and Ogisi and Osamor (10) respectively. Since Pseudomonas does not normally inhabit the upper respiratpry tract, its

presence in the middle ear cannot be ascribed to an invasion through ET, it must be considered as secondary invader gaining access to the middle ear via defect in tympanic membrane.

The range of S.aureus prevalence in OM can be said to be wide since 30.8% was recorded in this work while Ikeh et. al (12) reported 44% and Azeez (18) 25%

Anaerobic investigation was excluded in this study since anaerobic cultivations are not routinely done for OM plus the fact that very few reports suggest that anaerobic bacteria may cause OM and studies of gas tension in middle ear show that the middle ear cleft poorly support anaerobic growth (12). Giebin(3) had earlier reported that middle ear effusion culture are sterile for anaerobic bacteria.

It is estimated that 70% of children would have had one or more episodes of OM by their third birthday(12) and in agreement with this, children accounted for 76.9% as against 23.1% for adult. This high prevalence in children is statistically significant ($P<0.05$) using T-test and correlates with several other reports (2,3,18). That OM is predominantly an early childhood disease can be explained by several factors including the immature and short ET, malnutrition, immature immune response, frequency of upper respiratory tract infection in children, poverty, poor hygiene, overcrowding, group daycare attendance, bottle feeding and postural (horizontal) feeding practices: such as night breast feeding and that whereby the baby is forced to swallow watery pap or liquid drugs by intermittent closure of the baby's nose.

The ratio of male to female was insignificant (1:1.11) with female slightly higher. This is in contrast to Pukander et. al (22) and Azeez(18) who recorded more males than females. The incidence, of more females in this work can be explained by their frequency of using cotton buds to clean ears possibly resulting in the introduction of organisms into the middle ear.

The overall percentage sensitivity of the organisms to Gentamycin and Ofloxacin are comparable to the findings of Ikeh et. at (12) and Azeez (18). Ofloxacin may however not serve a useful purpose in children among whom the disease is most common since it belongs to quinolone group of antibiotics which are usually contraindicated as paediatric regimens(18) However, S.aureus, the only Gram positive isolate and second in prevalence rate showed good sensitivity to some of the commonly used drugs like Erythromycin, Streptomycin and Chloramphenicol. And this agrees with the work of Ako-Nai et. al. (23).

This work has recorded a high resistance of bacterial isolates to the commonly used and cheaper antibiotics. This underscores the need for more effort to be geared towards new drug formulations that will cater for children of all ages and the need to intensify the campaign against drug abuse.

RECOMMENDATIONS

It has been reported that children who were breast-fed for 12 months or more had significantly less frequent ear disease related to OM than did infants who were bottle fed at birth or within the first months of life(2), therefore, the campaign on baby friendly programme of breast feeding should be intensified while postural (horizontal position) feeding of children be discouraged and emphasis should be on upright position of feeding. Mothers attending both antenatal and postnatal clinics can be enlightened on the dangers of the wrong position of feeding.

Infants should be cared for at home instead of daycare centres since it has been reported that infants cared for in group daycare centres have higher episodes of AOM(2).

The government is therefore implored to extend maternity leave period from the present 3 months to 6 months in Nigeria. Other recommendations include: General good hygiene practices, avoiding overcrowding, good balance diet, appropriate use of antibiotics, bringing cases of OM early enough to the hospitals. The

bacteriology of OM underscore the need of monitoring the changing trends in etiology and multi-resistant strains of causative agent of OM. Bacteriology of OM has helped to discover cases of OM that only antibiotic treatment can take care of instead of painful and resource wasting surgery that has been mistakenly done in the past for common OM.

Lastly if the ear fails to dry up upon application of antibiotics or is unresponsive to antibiotic treatment, it must not be forgotten that such cases could be due to etiologic agents like fungi such as Aspergillus niger as well as Candida albicans and even viral agents.

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