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OTITIS MEDIA IN CHILDREN: A CASE- CONTROL STUDY AT THE SPECIALIST HOSPITAL, BAUCHI STATE, NIGERIA

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ABSTRACT

A survey of Otitis Media (OM) in children attending the Ear, Nose and Throat (ENT) section of the Specialist hospital, Bauchi was conducted to determine its prevalence and isolates of microorganisms associated with its onset. A total of 400 ear swabs were randomly collected from children aged 0-12 years and subjected to Bacteriological and Mycological laboratory investigations. Their epidemiological data was also retrieved from case files and analyzed using standard methods. The most prevalent organisms isolated were Staphylococcus aureus 116 (34.94%), Proteus mirabilis 82 (24.70%), Escherichia coli 33 (9.94%), Streptococcus species, 27 (8.13%), Pseudomonas aeruginosa, 19 (5.72%) and Klebsiella species, 12 (3.61%). Others included other species of staphylococci, 7 (2.10%), Diptheriods (Normal flora), 5 (1.51%) and Candida albicans 31 (9.34%), with an overall assessment of 83% prevalence. The age and sex were statistically significant ($P < 0.01$) by Chi square. This finding reveals that OM is a common childhood problem in the study area. Therefore, increase awareness on good hygiene in maternal care operations, prophylaxis with antibiotics following known exposure and or predisposing factors and avoidance of haphazard use of antibiotics during therapy is hereby recommended.

Keywords: Prevalence, Otitis Media, Children, Specialist Hospital, Bauchi

INTRODUCTION

Otitis infection is the inflammation of the mucous lining of the ear cavity and may be characterized by purulent or non-purulent effusion (Geo *et al.*, 2001). There are several types of otitis infection depending on site of infection, virulence of the infecting organisms, antimicrobial resistance, history of infection and age of the patients (Rashid, 1985). These include the acute otitis media (AOM), chronic otitis media (COM), chronic suppurative otitis media (CSOM) (Berman, 1995; Amusa *et al.*, 2005), otitis externa and cholesteatoma (Homoe, 2001). OM like any other disease of the respiratory tract in children is often caused by and or as a consequence of nasopharyngeal infection which is often characterized by acute inflammation and effusion (Thomas, 1994; CDC, 2002). Ear infections in children are more frequent in the first 2 to 4 years of life (Arguedas *et al.*, 1998), because the Eustachian tubes are short and more horizontal than those of adults which allow bacteria, viruses and fungi to enter the middle ear more easily (Klein and Homeirer, 2005). Economic and human burden especially on infant and children with OM infection is increasingly being reported by researchers in the south and south-western parts of the country (Ogisi and Osaminor, 1982; Oni *et al.*, 2001; Ako-Nai *et al.*, 2002; Nwabuisi and Ologe, 2002; Oguntibeju, 2003; Wariso and Ibe, 2006). In

the North central and North Eastern regions, unpublished data show that the high prevalence of OM in children is due to bacterial infections (Ikeh, 1993; Tomfafi, 1998). The paucity of reported and published information on the prevalence of OM in children in Bauchi state in Northern Nigeria necessitated this study.

MATERIALS AND METHODS

Study Area

This study was carried out at the Specialist Hospital, Bauchi. It is the major health facility of the state located in its capital, Bauchi local Government Area (LGA). Bauchi is located on latitude N 10° 30' 0" and longitude E 10° 0' 0" (Anon 2010a). It is a first-order administrative division in the northern part of the Nigeria with population size of 4,706,909 bordered by seven states, Kano and Jigawa to the North, Taraba and Plateau to the South, Gombe and Yobe to the east and Kaduna to the west and has two distinctive vegetations: Sudan and Sahel Savannah. The land area is 549,260 square kilometers representing about 5% of the country's total landmass, made of 20 LGA's. There are 55 different tribes; the principal ethnic groups include Fulani, Hausa, Gerawa, Sayawa, Jarawa, Bolewa, Karekare, Kanuri, Fa'awa, Butuwa, Warjawa, Zulawa and Badawa (Anon 2010b).



Study design

A case – control study design was adopted where any child diagnosed with ear infection was referred to as a case and the total number of children not diagnosed of ear infection served as control. The cases were sampled daily over a period of six months from October, 2009 to March, 2010.

Specimen collection

Ear swabs were collected randomly from patients (infants and children) attending the Ear, Nose and Throat clinic (ENT) of the Specialist Hospital Bauchi using sterile cotton ear bud (SEA PETERS[®] SWAB, CHINA) as described by Oguntibeju, 2003. These collected ear swabs were used immediately before the commencement of antibiotic therapy.

Isolation of pathogens

Bacteriological studies: Collected samples were inoculated onto MacConkey Agar (MCA), Blood Agar (BA) and Chocolate Agar (CA) plates (Baker and Silverton, 1998; Cheesbrough, 2002). After 24 hours of aerobic incubation, colonial and cultural morphology were read and taken into consideration for further identification and characterization process. Pure isolates were obtained by repeated sub culturing of these organisms onto Nutrient Agar (NA) plates, and then maintaining on NA agar slants at 4 °C until required.

Mycological studies: Collected samples were also inoculated on to Saboraud Dextrose Agar (SDA) (Baker and Silverton, 1998; Oguntibeju, 2003). All plates were inoculated under aseptic conditions and incubated aerobically at 25°C for 72 hours. Plates were observed macroscopically at intervals for yeast cells. Plates that yielded creamy, mucoid and musty colonial appearance were suspected to be yeast cells and were further investigated.

Identification and characterization of bacterial isolates: The cultural characteristic of isolates were observed 24 hours post incubation for morphology, cultural characteristics (color, cell size, cell distribution, edge types) and physiological characteristics (Gram's staining and motility Test). Other biochemical reactions such as catalase, coagulase, indole, urease, oxidase and citrate test were also conducted. The results obtained were compared with the Identification table (Baker and Silverton, 1998; Wilson, 2008).

Identification and characterization of yeast isolates: After 72 hours of aerobic incubation, plates were read macroscopically to determine the morphological features of isolated yeast. Mucoid, musty and creamy large colonies were suspected to be yeast isolates. These were gram stained to observe the thick walled, round and budded chlamydospores and further investigated by physiological reactions such as serum tube test to observe for the production of germ tubes and sugar reactions for the production of acid and gas (Baker and Silverton, 1998; Wilson, 2008).

Data analysis

Epidemiological data obtained from case files were analyzed using simple descriptive statistics and

expressed as percentage (%) frequency and Chi-square analysis as described by Mahajan, (1997).

RESULTS

The total of 332 out of 400 samples was positive for microbial isolates giving an overall prevalence of 83.0% infection rate. A total of 301 were bacteria isolates with a prevalence rate of 75.25% and 31 were yeast isolates with a prevalence rate of 24.75%. The most prevalent organisms isolated were *Staphylococcus aureus*, 116 (34.94%), followed by *Proteus mirabilis*, 82 (24.70%), *Escherichia coli*, 33 (9.94%), *Streptococcus* species, 27 (8.13%), *Pseudomonas aeruginosa* 19 (5.72%) and *Klebsiella* species, 12 (3.61%). Others included species of staphylococci 7 (2.10%), Diptheriod, 5 (1.51%) and *Candida albicans* 31 (9.34%) as indicated in Table 1. Otitis media occurs more frequently in males (57.23%) as compared to females 42.77% (Table 2). The age groups ≤1-3 and 4-6 recorded the highest occurrence of 88.76% and 87.29% respectively with the least occurrence in the age group 10-12 years.

DISCUSSION

This study reveals an overall infection rate of 83.0%, bacterial and yeast infection rates being 75.25% and 7.75% respectively. This is similar to the reported prevalence of 84% in another study by Hanakuka, (1999). The 7.75% yeast prevalence is slightly higher than the 5.2% reported previously by Oguntibeju, (2003). *Staphylococcus aureus* was the most commonly encountered pathogen (34.94%) and the least was *Klebsiella* species (3.61%) while other species of *Staphylococcus* (2.10%) and Diptheroids (1.51%) were regarded as normal flora as represented in Table 1. This finding correlates with that previously reported (Ako-Nai, 2002) and the isolation rate of *Candida albicans* (9.34%) by Oguntibeju, (2003) and Aslam et al., (2004). Infants and children of 0-six years and below are within the OM susceptible group. The high occurrence in this age groups ≤1-3 and 4-6 years could be attributed to the ongoing development of the immune system which is unable to cope with challenge posed by the microbes. This could also be due to the horizontal nature of the Eustachian tube in children which easily facilitates the food particles and infection agents into the middle ear (CDC, 2002; Klein and Homeirer, 2005). In conclusion, the high prevalence recorded in this study provides preliminary information and suggests that OM is a common childhood problem caused by a wide range of microbes. Control is best accomplished through good personal hygiene, prophylaxis with antibiotics following known exposure, avoidance of haphazard use of antibiotics during therapy and ultimately searches and development of new antimicrobial compounds; to help minimize the problem of resistance encountered globally as earlier stated (Elaine, 2007).



Most importantly mycological investigation should supplement other laboratory diagnostic procedures as well as sensitization/advocacy programmes to educate parents/guardians on prevention and control measures of OM.

Table 1: Microbial distribution of Organisms isolated from Otitis Media

Microbial Isolates	Frequency	Percentage (%)
<i>Staphylococcus aureus</i>	116	34.94
<i>Proteus mirabilis</i>	82	24.70
<i>Escherichia coli</i>	33	9.94
<i>Streptococcus</i> species	27	8.13
<i>Pseudomonas aeruginosa</i>	19	5.72
<i>Klebsiella</i> species	12	3.61
Other species of staphylococci	7	2.10
Diphtheroid	5	1.51
<i>Candida albicans</i>	31	9.34
Total	332	400

Prevalence of infection = 83.0%

n=332

Table 2: Distribution of sex and age in relation to the occurrence of Otitis Media

Age group (Years)	Male		Female		Total Infection	Total (%)
	Number tested	Number Infected	Number Tested	Number Infection Tested		
≤1-3	96	85	73	65	169	150 (88.76)
4-6	69	68	49	35	118	103 (87.29)
7-9	41	33	44	33	85	66 (77.65)
10-12	15	4	13	9	28	13 (46.43)
Total	221	190 (57.23%)	179	142 (42.77%)	400	332

χ^2 Test: $P < 0.01 = H_A$: Accepted n = 332

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