The International Journal Of Engineering And Science (IJES)
|| Volume || 4 || Issue || 8 || Pages || PP -33-37 || 2015 ||
ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805

Bacteriology of otitis media among patients attending general hospital Bichi, Nigeria

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- ----------**ABSTRACT**----------
Otitis media is the inflammation of the middle ear and has a worldwide distribution, particularly among children. A total of 68 patients between the ages 0-42 years who presented with sign and symptoms of otitis media at Bichi general hospital were enrolled for this study. Middle ear discharge were collected, processed and bacterial isolates identified using standard microbiological techniques. Disc susceptibility tests were performed on bacterial isolates. Results indicated that there was a high frequency of occurrence of bacteria incriminated in otitis media in the 0-5 and 6-11 year age groups in the two sexes. Male patients in the two age groups were more infected than the female counterparts. The sensitivity pattern obtained in this study show a progressive increase in the emergence of strains that are resistant to many chemotherapeutic agents. Drug resistance among bacterial isolates is a common phenomenon placing challenge to both medical practitioners and genetic scientists. A routine check on sensitivity patterns among these pathogens is vital so as to regulate the prescription measure to be employed.

Keywords *– Otitis media, antibiogram, prevalence, resistance.*

Date of Submission: 10 August 2015 Date of Accepted: 20 August 2015

I. INTRODUCTION

Otitis media is defined as the inflammation of the middle ear and is a common cause of children's visit to physicians [1, 2]. While the term otitis media commonly denotes an inflammation of the middle ear, the disease can be more accurately described as acute, sub-acute or chronic, and suppurative or nonsuppurative and often recurrent [3]. Previous studies [4, 5, 6, 7, 8] have reported otitis media to have worldwide prevalence, affecting all age groups but is more common in children [1, 9]. A study carried out [10] indicated that; Eustachian tube abnormalities are a primary determinant of otitis media. Other determinants include viral infections and systemic immune deficiencies which predispose to superimposed bacterial disease. Thus, sources of infection in otitis media are dependent on the route by which infection reaches the middle ear, and the principal route is by which this occur is the Eustachian tube [11]. The lower immunity of children as compared to adults, the shorter and more horizontal Eustachian tube in children which permits easier access of microorganisms from the nasopharynx, and the fact that bacteria adhere better to epithelial cells of children than adults, have been suggested as possible reasons for the higher prevalence in children [1, 2, 12, 13,]. Other risk factors for otitis media include exposure to smoke, crowded living conditions and low socio-economic class [1, 14]. The preceding conditions are very common in resource-poor countries like Nigeria. In otitis media the etiologic bacteria may be aerobic (e.g. *Pseudomonas aeruginosa*, *Escherichia coli, Staphylococcus aureus, Streptococcus pyrogens, Proteus mirabilis,* Klebsiella species) or anaerobic (e.g. *Bacteroides, Peptostreptococcus, Proprionibacterium*) [8, 15, 16]. As these diseases can be prevented and treated, public awareness on personal hygiene should be increased among the general population to decrease morbidity due to the disease also treatment is very necessary and urgent to prevent complications such as meningitis, septicaemia, amongst others [17]. Therefore, routine sample culture and antimicrobial susceptibility profiling would play a significant role in reducing the incidence of otitis media complications especially in this era of increasing microbial resistance. This study aims to determine the prevalence of otitis media among otitis media patients of different sexes and ages groups. The study also seeks to determine the antibiogram of the bacterial etiologic agents of otitis media and to recommend the most efficient antibiotic for its treatment.

II. MATERIALS AND METHODS

2.1 Study population

The study was conducted at the general hospital, Bichi, Kano, Nigeria. A total of 68 (39 males and 29 females) patients with signs and symptoms of otitis media attending ear, nose and throat clinics in the hospital were enrolled for this study in July, 2013.

2.2 Sample collection and processing

Pus or purulent discharges from cases of otitis media were collected from patients having the disease using sterile swab sticks as described in [18]. All specimens were transported to the laboratory and analyzed within one h of collection. The ear swabs were used to inoculate onto chocolate agar and MacConkey agar plates by streaking. The chocolate agar plates were incubated at 5% carbon dioxide in a candle jar and the MacConkey plates incubated aerobically at 37^{o}C for 24 h. The resulting bacterial colonies were identified by standard bacteriological techniques as reported in [2] according to [19] and disc susceptibility test performed by the BSAC method [20].

III. RESULTS

Table 1 shows the distribution of bacterial agents of otitis media according to sex and age groups at Bichi general hospital. The result indicated that there was a high frequency of occurrence of bacteria incriminated in otitis media in the 0-5 and 6-11 year age groups in the two sexes. Male patients in the two age groups were more infected than female patients while in the 12-17 year age group the male and the female had an equal rate of infection. It was also observed from Table 2 that the frequency of infection decreased with age.

Table 1 Distribution of bacterial agent of otitis media in relation to age

Age group (years)	**Sex**		**Sample size (frequency)**
	Male	**Female**	
0 - 5	14	5	19
6 - 11	12	9	21
12 - 17	8	8	16
18 - 23	1	4	5
24 - 29	3	2	5
30 - 35	0	1	1
36 - 41	0	0	0
>41	1	0	1
Total	**39**	**29**	**68**

Table 2 shows the distribution of bacterial agent of otitis media in relation to gender. Out of the fourteen (14) isolates of *Escherichia coli* recorded, nine (9) were from male patients and five (5) from female patients. Out of the sixteen (16) isolates of *Pseudomonas aeruginosa* recorded, ten (10) were from male patients and six (6) from female patients. Of the eleven (11) isolates of Proteus species recorded, six (6) were from male patients and five (5) from female patients. Of the fourteen (14) isolates of *Staphylococcus aureus* recorded, eight (8) and six (6) were from male and female patients respectively. Also, the thirteen (13) isolates of Streptococcus species recorded, six (6) and seven (7) were from male and female patients respectively. Table 2 further indicates that of the overall total bacterial agents isolated sixty-eight (68), Thirty-nine (39) were from the male patients and twenty-nine (29) were from the female patients.

Table 2 Distribution of bacterial agent of otitis media in relation to gender

Sex	*Escherichia coli*	*Pseudomonas aeruginosa*	Proteus species	*Staphylococcus aureus*	Streptococcus species	Total
Male	9	10	6	8	6	39
Female	5	6	5	6	7	29
Total	**14**	**16**	**11**	**14**	**13**	**68**

Table 3 shows the Antibiogram of the bacterial agents incriminated in otitis media against ten (10) antimicrobial agents. Fourteen (14) *Escherichia coli* isolates were tested against each antimicrobial. Out of the fourteen isolates, ten (10) were sensitive to augmentin, 9 to ampicillin, 7 to streptomycin,7 to gentamicin, 5 to cefotaxime, 3 to erythromycin, 7 to ciprofloxacin, 3 to chloramphenicol, 6 and 5 to ofloxacin and azithromycin respectively. A total of sixteen *Pseudomonas aeruginosa* isolates were tested. Nine (9) were sensitive to augmentin, 4 to ampicillin, 6 to streptomycin,8 to gentamicin, 4 to cefotaxime, 8 to ciprofloxacin, 6 to chloramphenicol, 4 to ofloxacin. Of the eleven (11) isolates of Proteus species tested, seven (7) were sensitive to augmentin, 6 to ampicillin, 4 to streptomycin, 3 to gentamicin, 1 to cefotaxime, 3 to erythromycin, 6 to ciprofloxacin, 5 to chloramphenicol, 6 and 6 to ofloxacin and azithromycin respectively. Fourteen isolates of *Staphylococcus aureus* were tested. Nine (9) were sensitive to augmentin, 4 to ampicillin, 7 to streptomycin, 6 to gentamicin, 1 to cefotaxime, 6 to erythromycin, 4 to ciprofloxacin, 7 to chloramphenicol, 6 and 5 to ofloxacin and azithromycin respectively. Thirteen (13) isolates of Streptococcus species were also tested against ten antimicrobials. |Ten (10) were sensitive to augmentin, 5 to ampicillin, 3 to streptomycin, 5 to gentamicin, 2 to cefotaxime, 5 to erythromycin, 4 to ciprofloxacin, 6 to chloramphenicol, 2 and 4 to ofloxacin and azithromycin respectively.

Table 3 Antibiogram of the bacterial agents of otitis media

	Number of isolate sensitive to the antimicrobials									
Organism (No. of Isolate)	AG	PN	S	CN	CTX	E	CPX	C	OFX	AZM
Escherichia Coli (14)	10	9	7	7	5	3	9	3	6	5
Pseudomonas aeruginosa (16)	9	4	6	8	4	NT	8	6	4	NT
Proteus species (11)	7	6	4	3	1	3	6	5	6	6
Staphylococcus aureus (14)	9	4	7	6	1	6	8	7	6	5
Streptococcus Species (13)	10	5	3	5	2	5	9	6	2	4

AG= Augmentin, PN= Ampicillin, S= Streptomycin, CN= Gentamicin, CTX= Cefotaxime, E= Erythromycin, CPX= Ciprofloxacin, C= Chloramphenicol, OFX= Ofloxacin, AZM= Azithromycin, NT= Not tested

IV. DISCUSSION

The bacterial agents encountered in the present study were Streptococcus species, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli* and Proteus species. This corroborates the works of [7, 8, 21, and 22] that isolated same organisms from patients with bacterial otitis media. *Pseudomonas aeruginosa* (23.5%) was the most prevalent causing bacterial otitis media followed by *Staphylococcus aureus* and *Escherichia coli* (20.6% each) and the least was Proteus species (16.2%).Most of these organisms are part of the normal flora of skin and are opportunistic pathogens implying that if they gain entrance Into the human body they cause infection to tissues and mucous membranes [23].

The finding of this study also reveals that bacteria causing otitis media has a higher prevalence among the male patients than their female counterparts. These observations agree with that of [8, 24, 25,] who reported the occurrence of otitis media been more prevalent among male than female, the reason for this is unclear. Similarly, the results of this study reveal that children less than six (6) years are more prone to otitis media; this is in agreement with previous studies such as [6, 7, 25, 26]. Children usually have recurrent episodes of otitis media than older aged. This is due to so many factors such as developmental differences between children and adults with respect to anatomical positioning of the Eustachian tube; children have shorter and more horizontal Eustachian tube. In addition children are frequently exposed to the hospital environment where the organisms have high rate of colonization and are transferred mostly to them by healthy workers that deliver health services to them [27]. The socio-cultural behaviour of the children often playing with whatever comes their way contributes to this and of course, the immunity, which at this stage is usually not fully developed. Studies have shown that high incidence of otitis media is more prevalent in developing countries [28, 29]. The high rate in the developing countries could be due to poverty with its accompanying factors of overcrowding, poor sanitation and inadequate medical facilities.

The sensitivity pattern obtained in this study is similar to those reported by [6, 30, 31, and 32] by showing a progressive increase in the emergence of strains that are resistant to many chemotherapeutic agents. However, in the present study, a substantial increase in resistance has been observed even to augmentin, third-generation cephalosporin, quinolones as well as the frequently used antimicrobials such as gentamicin, erythromycin, azithromycin and chloramphenicol. The overuse and misuse of antimicrobials have been reported to lead to the death of sensitive strains leaving resistant strains to survive, multiply and infect new hosts [33]. These factors probably account for the pattern of resistance observed in this study.

V. CONCLUSION

Pseudomonas aeruginosa was the predominant bacterial isolate causing otitis media (23.5%), and otitis media incidence was more common among children less than six years. In this present study augmentin and ciprofloxacin were found to be effective in the treatment of otitis media. Drug resistance among bacterial isolates is a common phenomenon placing challenge to both medical practitioners and genetic scientists. A routine check on sensitivity patterns among these pathogens is vital so as to regulate the prescription measure to be employed.

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