



BACTERIOLOGICAL PROFILE AND DRUG RESISTANCE PATTERNS OF OTITIS MEDIA PATIENTS

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ABSTRACT

Ear infection is a highly prevalent disease in the world. The long-standing chronic suppurative otitis media. Media can result in severe complications like hearing impairment, death, and severe disability due to central nervous system involvement in developing countries. The objective of this study is to determine the bacteriological profile and resistance pattern of antibacterial agent of ear infection from patients seen at ear nose and throat clinic of Baghdad Hospital from September 2013 to June 2014. The ear swabs were cultured on blood agar, MacConkey agar and chocolate agar according to the standard microbiological procedures. The isolates obtained were identified by conventional methods using biochemical tests and the antibiotic sensitivity test was determined by disk diffusion method. A total of 96 study subjects were included in this study. Among these, 28 (29%) were male and 68 (71%) were females. Of 112 bacterial isolates identified from positive ear swabs were: *Pseudomonas aeruginosa* 64 (57%), *Staphylococcus aureus* 28 (25%), *Proteus species* 8 (7%), *Enterobacter species* 8 (7%), and *Klebsiella species* 4 (3.6%). The overall resistance profile of antibacterial agent, Ceftriaxone, and Norfluxacilline showed high level of antibacterial effect on all identified bacterial species. On other hand, all isolates were highly resistance to ampicilin and amoxacillin. Most of the isolates were resistant to commonly prescribed drug in the area. However, Ceftriaxone, and Norfluxacilline were highly active against the isolated organism, whereas Gentamycin was moderately active. Therefore, culture and susceptibility test is vital for appropriate management of ear infection in study area.

KEYWORDS: bacteriological profile, resistance pattern, antibacterial agent, ear infection.

INTRODUCTION

The ear is the responsible for hearing and also maintaining balance, its divided into the inner, middle and outer ear with the middle and outer regions being most susceptible to injury and infections (Richard and Robert, 1996). The infections of ear infections are of different types with otitis media being the most common, (Weiner and Collison, 2003). The inflammatory disease of the mucosal lining of the middle ear is called otitis media (Brooks and Saantosa, 1995), it is one of the most common illnesses in children. (Nussinovitch *et al.*, 2004). This is due to the shorter length of the Eustachian tube and more a horizontally inclined orientation in children than in adults (Weiner and Collison, 2003). It involves a different signs and symptoms (Tapiainen, 2002) and the ear discharge is the commonest symptoms of ear infection (Variya *et al.*, 2002). Ear infections can be caused by bacteria, fungi and viruses with bacteria ranked first (Bello *et al.*, 2011). Bacterial infections of the middle ear usually originate from the upper respiratory tract, with the bacteria reaching the ear through the Eustachian tube (Brooks and Saantosa, 1995). Bacteria that are frequently associated with infections are *Haemophilus influenzae*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Streptococcus pneumoniae*, *Pseudomonas aeruginosa* and *Moraxella catarrhalis* (Mora *et al.*, 2002; Ronald, 1995) and *E. coli* (Bluestone, 1998; Abera and Kibret, 2011). Bacteriology characteristics, which

shift toward Gram negative pattern with *P. aeruginosa* being the most common, along with other organisms like *Proteus*, *Bacillus*, and *E. coli* as shown by a host of studies conducted over the years (Sharma *et al.*, 2004).

It is a well-known that microbial drug resistance is a growing global problem. In Gram-negative bacteria, the most resistant pathogens are *P. aeruginosa*, *E. coli* and *Klebsiella* spp. and with increasing trends observed for all major anti-Gram negative agents like fluorquinolones, beta-lactams, and aminoglycosides (Rossolini *et al.*, 2007). Serious infections caused by Gram-positive bacteria are increasingly difficult to treat because of pathogens such as penicillin-resistant *S. pneumoniae* and methicillin-resistant *S. aureus* (MRSA). Also, the detection of multidrug resistant isolates may further limit therapeutic options (Menichetti, 2005). Therefore, the aim of this study is to determine bacterial etiologic agents of otitis media infections and their antibiotic resistance patterns among patients who visited ENT clinics.

MATERIALS & METHODS

Ear swab specimens were collected from 96 patients with various ear infections at Teaching Lab. center of Bagdad Hospital from September 2013 to June 2014. The ear swabs were directly inoculated on Blood and MacConkey agar plates which were incubated aerobically, and on Chocolate

agar plates which were incubated under 5% CO₂ atmosphere in a candle jar. All plates were incubated at 37°C for 24 - 48h under sterile conditions. All bacterial isolates were identified based on their colonial morphology, cultural characteristics, gram stain reaction, and standard biochemical tests (Cheesborough, 1991). Antibiotic susceptibility testing was done according to the Kirby-Bauer method. Bacterial suspension was prepared by emulsifying 3-5 discrete colonies of each isolate and then adjusted in comparison with to 0.5 McFarland tube and inoculated on Muller Hinton agar that tested against various antibiotic disks which were Ampicillin (10µg), Amoxicillin (10µg), Chloramphenicol (30µg), Gentamycin (10µg), Ceftriaxone (30µg), Norfluxacilline (10µg).

RESULTS & DISCUSSION

Only a 96 (80%) ear swabs specimens were bacterial cultures positive from a total of 120 specimens tested in this study from a period between September 2013 to June 2014. The isolation rate in the present study (80%) is comparable to other studies (Bello *et al.*, 2011; Motayo *et*

al., 2012) which reported an isolation rates of 83% and 84% respectively. This work showed that mostly patients having acute otitis media that followed by chronic suppurative otitis media which is agree with other authors (Oni *et al.*, 2002; Motayo *et al.*, 2012). The ages of patient group in this study were 1-15 years since the burden of the illness is higher in children than adults. This is contributed to the fact that younger children are more prone to otitis media related to their shorter and horizontal nature of Eustachian tubes, immune status, malnutrition and frequent exposure to upper respiratory tract infections (Bluestone and Klein, 2001; Lanphear *et al.*, 2014). Females were more affected by ear infections than males. 68 (71%) were females and 28 (29%) were males (p<0.05) resulting in an overall female to male ratio of 2.4:1. A similar finding was also reported by Hassan and Adeyemi, 2007. This may be due to the difference between ear cleaning habit of the females and males. In some tradition, cotton swabs were used by females to clean their ears which may result in transferring of pathogens from the external skin to the middle ear.

TABLE 1: Frequency of bacteria isolated from ear swabs of otitis media patients

Bacterial isolates	No.	%
<i>Staphylococcus aureus</i>	28	25
<i>Pseudomonas aeruginosa</i>	64	57
<i>Proteus spp.</i>	8	7
<i>Enterobacter spp.</i>	8	7
<i>Klebsilla spp.</i>	4	4
Total	112	100

A total of 112 bacterial isolate were isolated from 96 otitis media patients. The individuals who had bacterial isolates, 80 (83%) had single bacterial infection while 16 (17%) had mixed bacterial infection. This is comparable with the rates of previous studies conducted in Ethiopia (Abera and Kibret, 2011) and Nigeria (Osazuwa *et al.*, 2011). Majority of the ear infection 84 (75%) were caused by Gram negative bacteria when compared to Gram positive bacteria 28 (25%). This data is correspondence with other reports (Oguntibeju, 2003; Oyeleke, 2009; Abera and Kibret, 2011) but it is contradictory to others (Ekpo *et al.*, 2009). In the current study, the predominant bacterial isolates were *Pseudomonas aeruginosa* (57%) followed by *Staphylococcus aureus* which accounted for 25% of the total isolates, *Proteus spp.* and *Enterobacter spp.* (8%) and the least prevalent pathogen was *Klebsiella spp.* (4%) (Table 1). Similar results have been observed by other authors reported that *Pseudomonas aeruginosa* and *Staphylococcus aureus* are the most common organisms isolated from otitis media patients

(Bardanis *et al.*, 2003; Arshad *et al.*, 2004; Abdelraouf *et al.*, 2014). This result is support the previous studies (Oyeleke, 2009; Oni *et al.*, 2002) but it is inconsistent with other studies conducted in different area which show that *S. aureus* (Ekpo *et al.*, 2009; Akinjogunta, 2011) is the most predominant isolate. This may due to the fact that bacterial colonization of otitis media increases as temperatures raises, which in turn increases the isolation rate of bacteria. As a result difference in isolation rate might be occurring related to the effect of climate and geographical variation. The frequency of *Pseudomonas aeruginosa* and *Staphylococcus aureus* in the present work may due to the ubiquitous nature of *Pseudomonas aeruginosa* and the availability of *Staphylococcus aureus* as normal flora of the nares, mouth and some other non-sterile sites (Ekpo *et al.*, 2009). Additionally, The virulent nature and rapid colonization properties of these two organisms also contributes to their high rate of recovery.

TABLE 2: Antimicrobial resistance of bacteria isolated from ear swabs of otitis media patients

Bacterial isolates	No.	Resistance%					
		AMP	AMX	C	CN	CRO	NOR
<i>S. aureus</i>	28	71.4	60.7	28.6	42.9	32.1	25
<i>Pseud. aeruginosa</i>	64	81.3	71.9	62.5	37.5	34.4	21.9
<i>Proteus spp.</i>	8	100	75	62.5	50	37.5	25
<i>Enterobacter spp.</i>	8	75	75	62.5	62.5	37.5	25
<i>Klebsilla spp.</i>	4	100	75	75	75	50	50

AMP (Ampicillin), AMX (Amoxicillin), C (Chloramphenicol), GN (Gentamycin), CRO (Ceftriaxone), NOR (Norfluraxacillin)

A total of six commonly prescribed drugs in the study area were tested against the identified bacterial species for antibacterial resistance pattern. Based on overall resistance profile of antibacterial agent, Norfluraxacillin and Ceftriaxone showed high level of antibacterial effect against the tested bacteria, since the resistance didn't exceeded 50% for both drugs. Whereas, Gentamycin showed a moderate antibacterial effect with a resistance ranged from 37.5% to 75%. On contrary, most of bacterial isolates in the current study were showed a highly level of resistance against both Ampicillin and Amoxicillin that ranged from 71.4-100% for Ampicillin and from 60.7-75% for Amoxicillin. Additionally, *Klebsilla spp.* was the most resistant bacteria of the tested isolates followed by *Proteus spp.* This result is similar to results seen by (Arshad *et al.*, 2004; Sharma *et al.*, 2004; Abdelraouf *et al.*, 2014) who reported that Gram-positive bacteria showed high frequency of sensitivity to Ceftriaxone and Chloramphenicol. While Gentamycin and Ceftriaxone were perfect antimicrobial agents against Gram negative bacteria. Prescription of antibiotics without laboratory guidance and over sale without physician prescription may contribute for high level drug resistant pattern.

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