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Original Research Paper

Medicine

INFECTIVE PROFILE OF EAR INFECTIONS IN PEDIATRIC VS ADULTS

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ABSTRACT

Introduction: Even though ear infection is primarily a disease of infants and young children, it can also affect adults.

Materials and method: A total of 40 subjects with otitis media infection were included in the study. Patients were grouped into 1–17 years and 19–30 years. Bacterial species were identified by standard microbiological methods manually.

Results: The most frequent bacterial isolates were staphylococcus aureus in children 10 (55.5%) and adults 6(27.2%).

Conclusion: *Predominant* bacterial isolate *was S. aureus in both adults and children, however there were more S. aureus in children than adults.*

KEYWORDS :

INTRODUCTION:

Otitis media is the inflammation of the middle ear cleft and the tympanum with otorrhoea lasting from 2 weeks to more than 3 months, with permanent perforation mainly caused by bacteria[1,2]. Ear infection may be acute or chronic purulent type[3]. About 65–330 million people suffer from ear infection worldwide and 60 % of them had significant hearing loss[4].

Even though ear infection is primarily a disease of infants and young children, it can also affect adults[5]. The disease may begin in childhood or as a complication of untreated or inadequately treated acute suppurative otitis media or may be chronic from onset[6]. The microorganisms may gain entry to the middle ear through a chronic perforation. Children tend to have higher predisposition to ear infection than adults because anatomy of the eustachian tube in children permits easier access of organism through the nasopharynx. Moreover, the incidence is higher in males than females[5,7].

AOM is the most frequent reason of medical consultation and the main indication of antibiotic therapy in childhood[8,9]. It usually occurs between the age of 3 months and 3 years, with a peak of incidence from 6 to 11 months. By the age of 3 years, up to 80% of all children have suffered at least once from AOM[10,11].

About 40% have had six or more AOMs by their seventh year of life[12]. The global incidence has doubled from 1970 to 1990 and was recently calculated to be 10.85% or 709 million per year, varying from 3.64% in central Europe to 43.37% in central Africa[8,12].

CSOM usually develops in the first years of life but can persist during adulthood. The disease affects 65–330 million people worldwide, mainly in developing countries. It has been estimated that there are 31 million new cases of CSOM per year, with 22.6 % in children less than 5 years old[12]. A cross-sectional study of bacterial microbiota in middle ear, adenoid and tonsil specimens from a paediatric patient with chronic serous OM utilizing 16S rRNA gene-based pyrosequencing analysis revealed Pseudomonas spp. as the most common pathogen present in the middle ear, whereas Streptococcus spp. dominated the tonsil microbiota at relative abundance rates of 82.7 and 69.2 %, respectively[13]. *Bacteroides* spp., *Clostridium* spp., *Peptococcus* spp., *Peptostreptococcus* spp., *Prevetolla melaninogenica* and *Fusobacterium* spp. are anaerobic pathogens that can cause CSOM[14,15].

MATERIALS AND METHOD:

Patients with ear problems coming to regional hospital Bilaspur from surrounding rural areas of Bilaspur, Solan, Hamirpur and Mandi Districts, constituted the study subjects. A total of 40 subjects with otitis media infection were included in the study. According to the age, the patients were grouped into 1–17 years and 19–30 years. The specimens collected from patients with ear exudates by using sterile cotton swabs under strict aseptic precautions and assist of aural speculum then processed immediately in the Lab. of microbiology.

Age and sex profiles and results of bacterial isolates and drug susceptibility of patients who had ear infection were retrieved. Ear discharge samples were inoculated on MacConkey agar, Blood agar, Mannitol Salt agar and Chocolate agar. All of the inoculated media were incubated at 37 °C for 18–24 h. Bacterial species were identified by standard microbiological methods manually.

Susceptibility testing was done on Mueller–Hinton agar using disk diffusion technique according to Kirby–Bauer Method[16].

The antimicrobial agents tested were: benzyl penicillin, ampicillin, tetracyclin, erythro, gentamicin, clindamycin, tmp/smx, amoxyclav, ciproflox, levoflox, pip/taz, cefuroxime, ceftriaxone, cefoperazone/sulb, amikacin, ertapenem, imipenem, linezolid and cefepime. The antibiotic susceptibility profiles were interpreted based on Clinical and Laboratory Standards Institute (CLSI 2014) guidelines.

RESULTS:

A total of 40 patients from clinically suspected patients of otitis media were tested and analyzed. Of them, 18 were children with age group 1-17 yrs and 22 were adult with 19-30 yrs of age. Out of 18 children 9(50%) were male and 9 (50%) were female. Out of 22 adult patients 8(36.4%) male and 14(63.6%). Out of 18 children 17 (94.4%) had microbial growth (no growth was present in 1 male patient), and all 22 (100%) adult patients had microbial growth (Table 1).

In children (Figure-1), The most frequent bacterial isolates were staphylococcus aureus 10 (55.5%), followed by escherichia coli in 2(11%), pseudomonas aeruginosa 1(5%) and proteus mirabilis 1(5%). In adults (Figure-2), The most frequent bacterial isolates were staphylococcus aureus in 6(27.2%), followed by pseudomonas aeruginosa in 5(22.7%), klebsiella pneumonia in 3(13.6%), staphylococcus epidermidis in 3(13.6%), and staphylococcus saprophyticus in 1(4.5%).

In children out of 10 S. aureus isolates, 9 (90%) were resistant to benzyl penicillin, 8 (80%) each for erythromycin,

clindamycin, ciproflox, and levoflox, 4(40%) for TMP/ SMX, and 1(10%) for teracyclin. Out of 2 escherichia coli isolates, 1(50%) each was resistant to ampicillin, ciproflox, levoflox, cefuroxime, and cefuroxime. Out of 2 isolates of staphylococcus epidermidis 2(100%) were resistant to benzyl penicillin, erythromycin, and ciproflox. 1(50%) were resistant to teracyclin, clindamycin, TMP/ SMX and levoflox. There were no resistant in pseudomonas aeruginosa isolates. 1 isolate of proteus mirabilis were showing resistant in ampicillin, PIP/TAZ, cefuroxime, ceftriaxone, imipenem, and cefepime (Table-3).

In adult patients, out of 6 S. aureus isolates, 6(100%) each were resistant for ciproflox and levoflox, 5(83.3%) for erythromycin, 4(66.6%) for clindamycin and benzyl penicillin, 3 (50%) for TMP/CMX, 2(33.3%) each for ampicillin and amoxyclav, and 1(16.6%) for cefuroxime. Out of 5 pseudomonas aeruginosa isolates 1(20%) each were resistant for benzyl penicillin, erythromycin, clindamycin, ciproflox, levoflox. Out of 3 klebsiella pneumonia isolates 3(100%) each were resistant for ampicillin, and cefuroxime. 1(33.3%) each of TMP/ CMX and ceftriaxone. Out of 3 staphylococcus epidermidis isolates 2(66.6%) each were resistant to benzyl penicillin, erythromycin and TMP/ CMX. 1 isolate of staphylococcus saprophyticus were 1(100%) resistant to benzyl penicillin and TMP/CMX (Table-4).

DISCUSSION:

A total of 40 patients from clinically suspected patients of otitis media were included in our study with 18 were children with age group 1-17 yrs and 22 adult patients with 19-30 yrs of age. Out of 18 children 9(50%) were male and 9 (50%) were female. Out of 22 adult patients 8(36.4%) male and 14(63.6%) (Table-1). In the study by Derese Hailu et al[17]., in 2016, 368 patients were included in the study with age range from 1-72 years. Of them, 205 (55.7 %) were males and 163 (44.3 %) female patients. Araya Gebereyesus Wasihun et al[3]., in 2015, total 162 patients were included in the study with age range 3 months to 69 years, 105 (64.8 %) of them were males and 57 (35.2 %) females. In the Chandima P. Karunanayake, et al[19]., in 2016, There were 2082 Caucasian children who participated in the study, with age range 6–17 years, 1025 (49.2%) male and 1057 (50.8%) female. In the study by Kasahun Gorems et al[20]., in 2018, Among 173 otitis media patients participated in the study; majority, 102(63%) were pediatrics Out of 18 children 17 (94.4%) had microbial growth (no growth was present in 1 male patient), and all 22 (100%) adult patients had microbial growth. According to the study by Derese Hailu et al[17]., in 2016 Overall, 296 (80.4 %) of otitis media had microbial isolates. In the study by Araya Gebereyesus Wasihun et al[3]., in 2015, pathogens were isolated from 157 (98.2 %), Kasahun Gorems et al[20]., in 2018, Pathogens were isolated from 160 (92.5%) of the patients.

According to our study in children (Figure-1), The most frequent bacterial isolates were staphylococcus aureus 10 (55.5%), followed by escherichia coli in 2(11%), pseudomonas aeruginosa 1(5%) and proteus mirabilis 1(5%). In adults (Figure-2), The most frequent bacterial isolates were staphylococcus aureus in 6(27.2%), followed by pseudomonas aeruginosa in 5(22.7%), klebsiella pneumonia in 3(13.6%), staphylococcus epidermidis in 3(13.6%), and staphylococcus saprophyticus in 1(4.5%). In the study by Kasahun Gorems et al[20]., in 2018 (Figure-3), The predominant isolate was Staphylococcus aureus (30.72%) followed by Proteus spp. (17.89%). According to the study by Derese Hailu et al[17]., in 2016 (Figure-4) The most frequent bacterial isolates were P. aeruginosa 88 (30.4 %) followed by S. aureus 78 (26.9 %) and Proteus spp. 65 (22.3 %).

In our study in children out of 10 (45.5%) S. aureus isolates, 9 (90%) were resistant to benzyl penicillin, 8 (80%) each for erythromycin, clindamycin, ciproflox, and levoflox, 4(40%) for TMP/ SMX, and 1(10%) for teracyclin. Out of 2 escherichia coli isolates, 1(50%) each was resistant to ampicillin, ciproflox, levoflox, cefuroxime, and cefuroxime. Out of 2 isolates of staphylococcus epidermidis 2(100%) were resistant to benzyl penicillin, erythromycin, and ciproflox. 1(50%) were resistant to teracyclin, clindamycin, TMP/ SMX and levoflox. There were no resistant in pseudomonas aeruginosa isolates. 1 isolate of proteus mirabilis were showing resistant in ampicillin, PIP/TAZ, cefuroxime, ceftriaxone, imipenem, and cefepime.

As per our study In adult patients, out of 6 S. aureus isolates, 6(100%) each were resistant for ciproflox and levoflox, 5(83.3%) for erythromycin, 4(66.6%) for clindamycin and benzyl penicillin, 3 (50%) for TMP/CMX, 2(33.3%) each for ampicillin and amoxyclav, and 1(16.6%) for cefuroxime. Out of 5 pseudomonas aeruginosa isolates 1(20%) each were resistant for benzyl penicillin, erythromycin, clindamycin, ciproflox, levoflox. Out of 3 klebsiella pneumonia isolates 3(100%) each were resistant for ampicillin, and cefuroxime. 1(33.3%) each of TMP/ CMX and ceftriaxone. Out of 3 staphylococcus epidermidis isolates 2(66.6%) each were resistant to benzyl penicillin, erythromycin and TMP/ CMX. 1 isolate of staphylococcus saprophyticus were 1(100%) resistant to benzyl penicillin and TMP/CMX.

According to Araya Gebereyesus Wasihun et al[3]., in 2015, The highest number of bacteria 98 (45.3 %) were isolated in the age group of 0–5 years (p = 0.02). *S. aureus, P. mirabilis, P. aeruginosa, S. pyogenes, S. pneumoniae* and *H. influenzae* were the dominant bacterial isolates in this age group. Of 46 *S. aureus* isolates, 100 % were resistant to ampicillin, tetracycline and penicillin (100 % each), (67.4 %) to ceftriaxone and (63 %) to doxycycline. Less resistance was observed to ciprofloxacin, gentamicin, erythromycin and norfloxacin. *P. aeruginosa* was resistant to tetracycline, ampicillin, nitrofurantonin (100 % each), 96.3 % to penicillin and amoxicillin clavulanic acid (88.9 %). Similarly, *E. coli* showed 50 % resistance to doxycycline, and ampicillin and nitrofurantonin (83.3 % each).

In our study there are more s. aureus isolates specially in children, Findlay and Janz showed that, among children aged 0 to 3 years, 46% of First Nations children living off reserve had an ear infection compared to 40% of all Canadian children within the same age range[20]. These results are similar to findings from other studies reporting that most children will have had an ear infection by their third birthday[21,22].

CONCLUSION:

In conclusion, bacterial ear infection is a major health problem in the study area. *Predominant* bacterial isolate *was S. aureus in both adults and children, however there were more S. aureus in children than adults*. The bacteria which have been isolated from otitis media have shown high level of antibiotics resistance in the study area. Majority of the bacterial isolates had multiple antibiotic resistant patterns. Hence antibiotics susceptibility test is mandatory before prescribing any antibiotics.

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Table 1: Socio-demographic characteristics and clinical manifestations of patients

	Children (n=18)	Adult (n=22)
Sex (male)	9(50%)	8(36.4%)
Age	1-17 yrs	19-30 yrs
ASOM	11 (61%)	8(36.4%)
CSOM	6(33.3%)	14(63.6%)
EAC FURUNCULOSIS	1	0

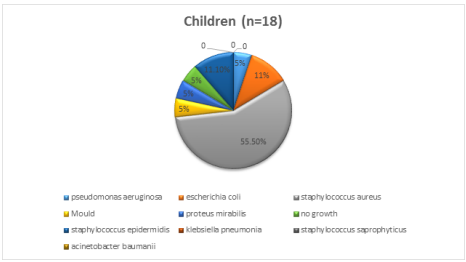

Fig 1 bacterial isolates in children

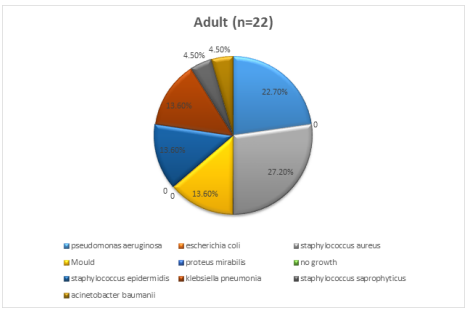

Figure:2 bacterial isolates in adult

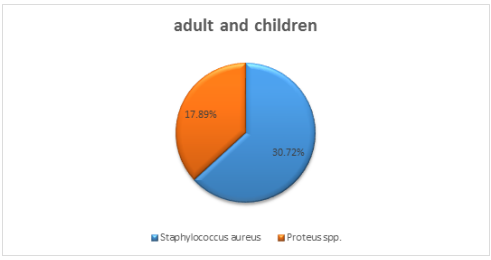

Figure:3 predominant bacterial isolates in the study by Kasahun Gorems et al., in 2018

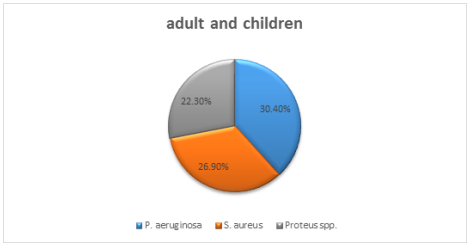

Figure:4 predominant bacterial isolates in the study by Derese Hailu et al., in 2016

Table 2 Resistance pattern of antimicrobial agents (%) in children

	BP	AMP	TC	ERY	CM	TMP/ SMX	CF	LF	PIP/TAZ	CFU	CFX	CFP/ SULB	IMI	CFP
pseudomonas aeruginosa (n=1)							0	0	0			0	0	0
escherichia coli (n=2)	-	1(50%)	-	-	-	0	1(50%)	1(50%)	0	1(50%)	1(50%)	0	0	0
staphylococcus aureus (n=10)	9 (90%)	-	1(10%)	8 (80%)	8(80%)	4(40%)	8(80%)	8(80%)	-	-	-	-	-	-
proteus mirabilis (n=1)		1(100%)				0	0		1(100%)	1(100%)	1(100%)	1(100%)	1(100%)	1(100%)
staphylococcus epidermidis (n=2)	2(100%)		1(50%)	2(100%)	1(50%)	1(50%)	2(100%)	1(50%)						

BP: benzyl penicillin, AMP: ampicillin, TC: teracyclin, ERY: erythromycin, CM: clindamycin, CF : ciproflox, LF: levoflox, CFU : cefuroxime, CFX : ceftriaxone, IMI : imipenem, CFP: cefepime

Table 3 : Resistance pattern of antimicrobial agents (%) in adults

	BP	AMP	ERY	CM	TMP/ CMX	AMXC	CF	LF	CFU	CFX
pseudomonas aeruginosa (n=5)	1(20%)	-	1(20%)	1(20%)	0		1(20%)	1(20%)	-	-
staphylococcus aureus (n=6)	4(66.6%)	2(33.3%)	5(83.3%)	4(66.6%)	3 (50%)	2(33.3%)	6(100%)	6(100%)	1(16.6%)	0
staphylococcus saprophyticus (n=1)	1(100%)	-	0	0	1(100%)	-	0	0	-	-
klebsiella pneumonia (n=3)	-	3(100%)	-	-	1(33.3%)	0	0	-	3(100%)	1(33.3%)
staphylococcus epidermidis(n=3)	2(66.6%)	-	2(66.6%)	3(100%)	2(66.6%)	-	1(33.3%)	1(33.3%)	-	-

BP: benzyl penicillin, AMP: ampicillin, TC: teracyclin, ERY: erythromycin, CM: clindamycin, AMXC: amoxyclav, CF : ciproflox, LF: levoflox, CFU : cefuroxime, CFX : ceftriaxone

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